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Modern Methods of Building Printing Presses

By Fred H. Colvin

Editor, *American Machinist*

Some of the tools and fixtures used in the new plant where the Kelly Press is built—Milling and drilling fixtures—Finishing cuts in cams with knurls

THE column or frame of the Kelly press described here is of box construction, and has the top and other portions surfaced to receive the operating parts. The surfacing of the column is done on the planer-type Ingersoll milling machine shown in Fig. 1, which also shows the type of holding fixture used.

The column goes over a pair of pedestals, *A*, *A*, Fig. 1. Clamps as at *B*, inside the column hold it to the table by means of an inner flange. Bolts or studs as at *C*, have clamps which go between the columns and hold them down and prevent movement under thrust of the cutters. An electric hoist handles the columns from the floor to the machine. The studs *D*, in the pedestals, are used to locate the columns sidewise and prevent vibration and side movement at the top.

A little surfacing is necessary inside the columns to face a pad for receiving some of the driving mechanism. This surface is machined on a Cincinnati traverse-head shaper as shown in Fig. 2. The shaper has a special toolhead carrying an extension with a clapper block at the end. The extension carries the tool inside the column for surfacing the pad.

An advantage of this machine is that it allows a second column to be placed in position while the first is being machined. The shaper head is traversed to the second position while the first column is being removed and another one set in position.

The boring of the columns for the driving shafts is done in a special fixture, Figs. 3 and 4, the necessary boring bars being located at fixed-center distances. The fixture is mounted on an old lathe that merely supplies the power for driving the bars. Some of the holes do not go through both column walls, as can be seen in Fig. 4. The bars for the blind holes are supported by substantial bushings inside the column. Special screw jacks are also used in clamping the columns and to prevent the walls from springing.

One of the succeeding operations, that of drilling and boring the column for various attachments, is shown in Fig. 5. It will be noted that a trunnion fixture is used. Fig. 6 shows the same machine with

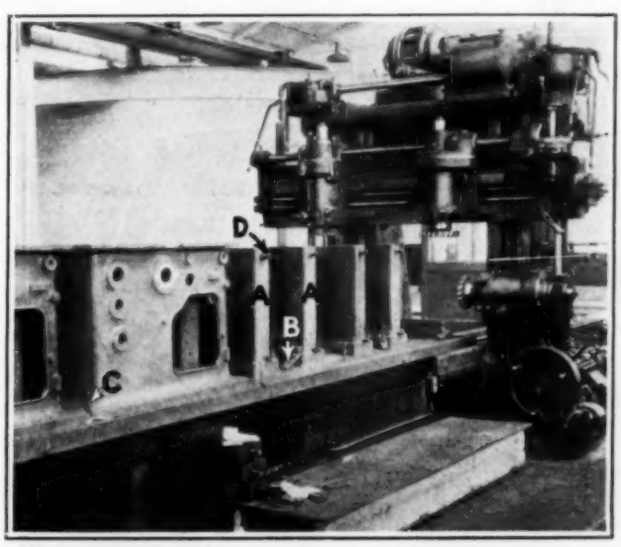


Fig. 1—Milling printing-press columns

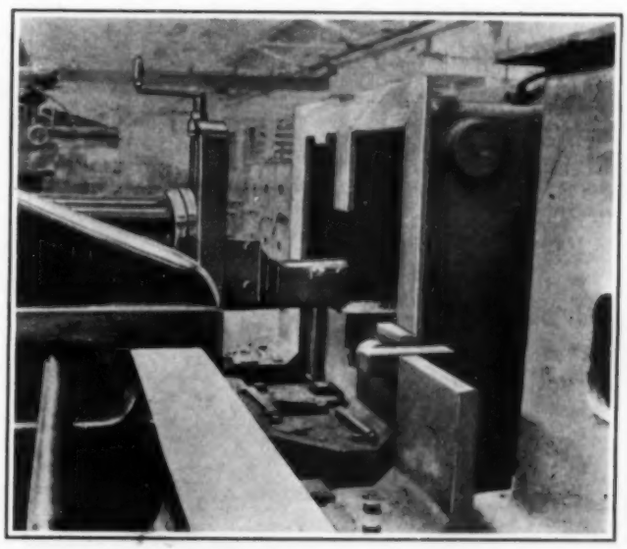


Fig. 2—Shaping pad inside column

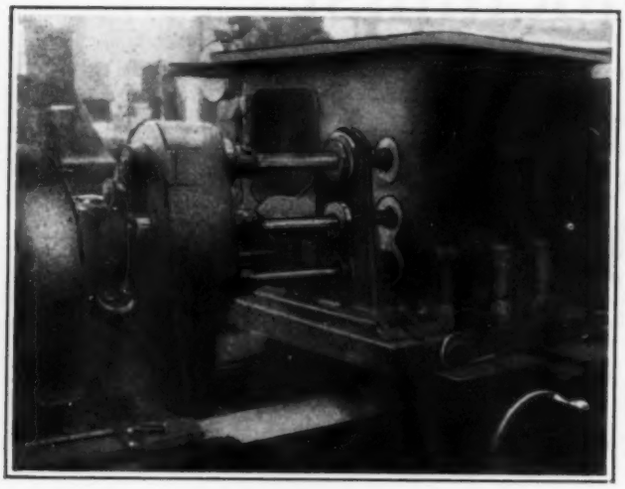


Fig. 3—Boring fixture for shaft bearings

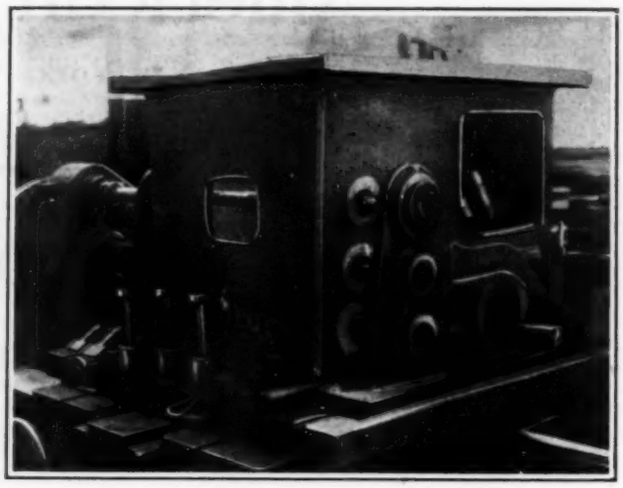


Fig. 4—The other end of the fixture

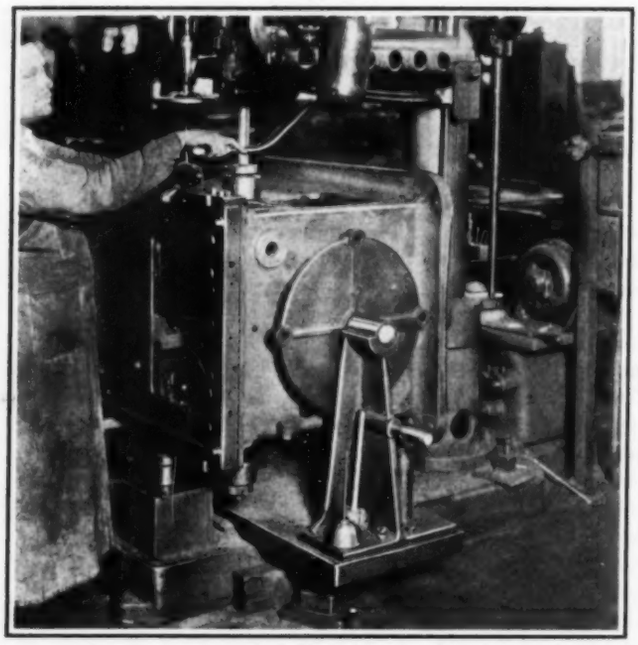


Fig. 5—Trunnion fixture for columns

the column in a different position. The column is supported on a mandrel that goes through an opening in the sides and is held in position by the rather ingenious method shown in Fig. 7. The rectangular blocks are fastened to the mandrel at the proper locations and the two setscrews lock the blocks inside the openings in each wall of the frame. This method holds the work firmly and is used in several of the machining operations, including the planing of the inside pad.

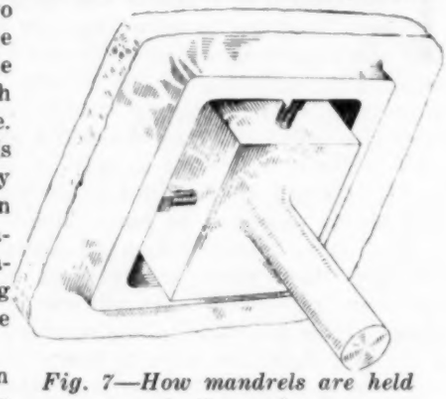


Fig. 7—How mandrels are held in the work

It will be seen that this fixture can not only be indexed, but can also be moved along in front of the drilling machine by means of the sliding base. In this way all parts of the column can be reached with a comparatively short-arm radial drilling-machine. As

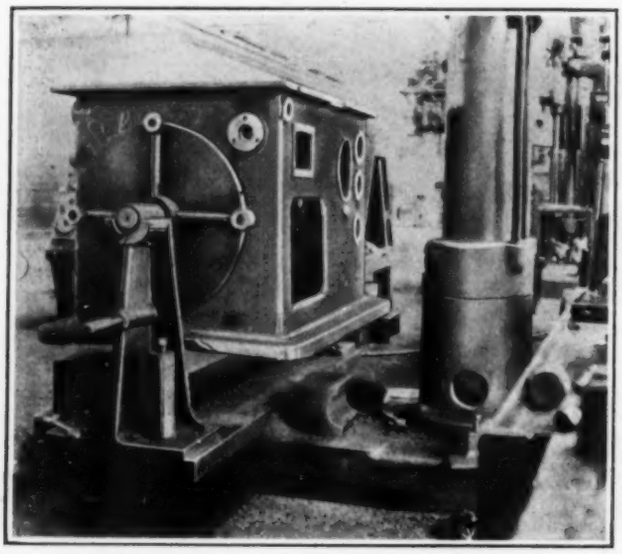


Fig. 6—Another view of drilling fixture

Fig. 8—Drill jigs on convenient racks

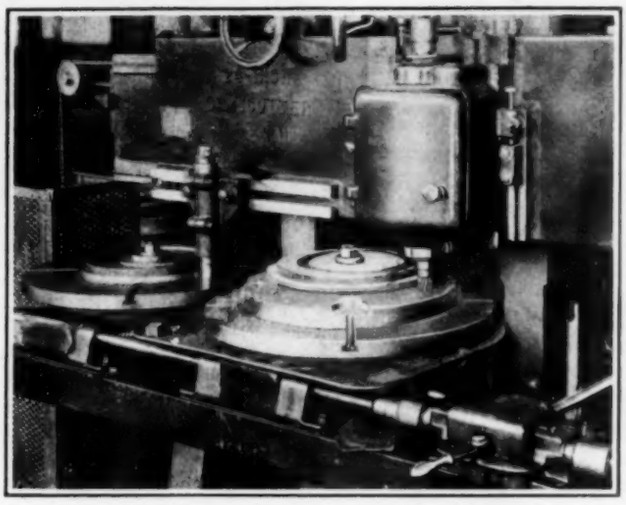


Fig. 9—One method of cutting cams

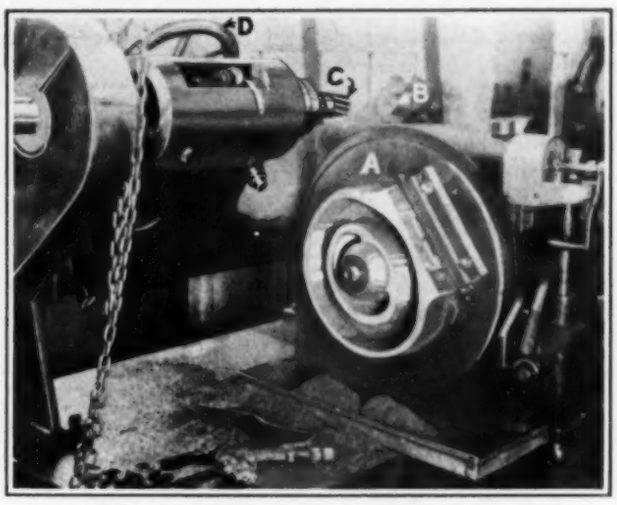


Fig. 10—Special cam-cutting machine

shown in Fig. 8, the drill jigs, or plates, are kept on an inclined rack near the drilling machines.

The Kelly press has several cams, two of which are shown in Figs. 9 and 10. The cam in Fig. 9 is being cut in a Garvin cam-cutting machine, the pilot and master cam being at the left. As shown, the outside cam race only is being cut but the inner race is cut at the same chucking, by setting the pilot or guide roll in its proper groove in the master cam and the cutter in its correct position.

The cam cutter shown in Fig. 10 was built specially for the job and is of somewhat unusual design. Both the cutting spindle and the guide are held in a heavy swinging yoke, and in line with each other. The yoke is handled by a 500-lb. hoist, making it easy to raise and lower it when necessary in changing the work. The work is bolted against the face plate *A*, which runs in a large, rigid bearing. On the other end of the short spindle is the master cam in which the guide roller *B* travels. The cutter *C* is on a large spindle arranged for end movement by means of handwheel *D*, and is provided with a micrometer stop.

With the arm or yoke swung down so that the guide roller *B* enters the master cam, the cutter spindle is fed into the work and the cam revolved. The cutter, of course, follows the path of the master cam on the other side and cuts the desired contour.

A rather unusual feature in connection with these cams is the use of a finishing cutter that is practically a burnishing tool. This burnisher increases the width of the cam slot only from 0.004 to 0.006 in. and leaves a fine surface for the cam roller to work against. The cutter diameter is 2.248 in. and that of the burnisher is 2.252 to 2.254 inches. Finishing by this method compresses the iron and leaves a polished surface similar to that found in a motor cylinder after the motor has been well broken in. It leaves a splendid bearing surface for the cam rollers.

We Ask Again

"What's Wrong With the Railroad Shops?"

By Ernest F. DuBrul

General Manager, National Machine Tool Builders' Association

NO SENSIBLE person questions the propriety of the railroads earning a fair return on the fair value of their property. That constitutional right is denied only by those whose ideas shade from pale pink to flaming red. That principle is rooted too deep in American ideals and law to be denied by any whole-souled American. On the other hand, another principle rooted just about as deep in the same ideals and laws, is that the railroads are charged with a peculiar public interest, and the public has a real interest in the efficient management of the railroads on that account. Only the most unteachable and stupid Bourbon would deny that principle. These two principles are both eminently fair. At times there may be disputes as to whether any particular circumstance is in accord with the principles, but there is no use arguing on the principles themselves.

To get a fair return under the first principle, the railroads are entitled to collect such freights and fares as will give it to them. The public is not entitled to fix rates so low as to deprive the railroads of the opportunity to earn a truly fair return. But under the second principle, the railroads are not entitled to claim a fair return on their investment over and above costs of inefficient management and wasteful operation. Under the second principle, the public is entitled to the best management that is humanly possible to secure, so that fares and freights may be kept at the minimum, consistent with a fair return under the first principle. It is, therefore, the manifest duty of railroad management to use every means possible to reduce costs of operation. Every deficiency in management or equipment increases cost of operation, and thereby keeps rates above what the public should pay to allow the roads a fair return.

Should the managers of our railroads continue to neglect any essential part of their duty of management, the public have a perfect right to point out these deficiencies and to insist that remedies be applied where needed. It does no good for managers to resent proper complaints, comments, or criticisms. Such resentment will not improve the relations of the railroads with the public, but will do quite the contrary, as all sensible managers know.

Bearing these two principles in mind, and in a spirit of fair play, both for the railroads and the public, we now come back to the question raised in 1922, by the *American Machinist*, "What's wrong with the Railroad Shops?" In the fall of 1922 *American Machinist* printed a number of articles on this subject. These articles gave the results of a survey by members of the *American Machinist* staff. They disclosed conditions with which many people were familiar, but which had not theretofore been blazoned to the world. It was not a pretty picture, and it showed that a great deal was wrong with those shops.

Previous to 1922, when that survey was made, the railroads had been suffering from the foolish public policy of starving the roads with uneconomically low rates, accentuated by the wastes of Government operation. Those two factors had much to do with the deplorable conditions of the shops in 1922. But severe as they were, those two factors did not account for all the bad shop conditions. Many of the evils pointed out in the survey were due to internal railroad executive policy that starved the mechanical departments, compared to the other departments of the roads. That starvation applied to the shop managerial personnel as well as to the equipment of the shops.

Shop Equipment Is Not Up-to-Date

Over two years have elapsed since those articles were printed—years of exceedingly good earnings for the railroads. Since 1922 the railroads have done wonders in improving service and operation. Much as they have done, no sensible manager would say that all the defects of 1922 have been eliminated, even from train operation. The roads have bought many new locomotives, new cars, new rails, new ties, and other operating materials. They have bought some machine tools but their shop equipments are still far from being up-to-date.

It would not be reasonable to expect the roads to be able to make up for many years of past neglect in the short space of two and a half years. Even though the funds were available, the common executive attitude of shop neglect could hardly be changed radically in such a short time. But it would appear reasonable to ask for some strong indications that a change was in sight as to the executive policy of starving the shops compared with the other departments. Unfortunately no radical change is forecasted. If the railroad executives really have radically changed their former ideas as to the shops, they have neglected to take the rest of the country into their confidence, and there are no strong signs of the coming change apparent to outsiders.

True, some roads have paid more attention to their shops and shop methods than they did two years ago. Some new tools have been bought here and there, to replace old ones that should have been scrapped years ago. Some orders for machine tools were placed by some railroads during the last two years of improved operation and increased revenue. But these tools were far from adequate in number to correct the grave deficiency that has been accumulating for many years, even in those roads. It is regrettable that reports from the field do not show very much awakening on the part of the mass of railroad managers to the importance of having the railroad shops in just as good relative condition as any other part of the roads' property. The expenditures of the last two years for shop equipment seem, on the whole, far less than proper in proportion to the expenditure for transportation equipment.

The railroad shop still seems to be considered much as a foundling left on the road's doorstep, where it isn't wanted, but where it has to be hushed up because its squalling will disturb the neighbors and make gossip. The field men of the machine tool industry still report painfully slow progress in bringing railroad shops, as a class, up to the state of efficiency that the public has a right to expect. They still report large systems wasting money repairing machines that were obsolete twenty years ago. They still report that equipment is inadequate in amount even in cases where some of it is relatively new. They still report cases of financial and purchasing officials continuing to overrule the mechanical departments, as to the makes of machines to be purchased, and insisting on tools being installed that are cheap but not efficient. They still report the use of pitiful makeshifts that make for high costs of maintenance of locomotives and cars, because there are no appropriations for efficient tools that would make for low costs.

They still report that, as in 1922, it isn't all a question of machinists and labor unions, but is largely a question of presidents and directors. From those reports we can still say, as the staff of the *American Machinist* found in the fall of 1922, the glaring faults of the railroad shops in the spring of 1925 are:

Inadequate and inefficient equipment.

Ignorance of those responsible as to what is proper equipment.

Improper tooling.

Lack of control of machining operations.

Disproportionate subordination of machining operations to moving the locomotive from the shop.

Insufficient exchange of knowledge and ideas between railroad shops and manufacturing shops.

Inability of those responsible to see that the railroad shop directly affects profits.

Lack of proper work-handling devices.

Prevalence of conditions causing lack of personal interest on the part of shop men in economical operation of the shop.

Why not take the shops into the road's official family instead of leaving them out on the doorstep to squall and to disturb the public's peace of mind as to the efficiency of railroad management?

Press Capacity Data

On page 376, Vol. 62, of the *American Machinist*, appeared the question, "What is a 50-Ton Press?" The answers received and the discussions that this question brought up, indicate a lack of reliable and understandable data which could be of constructive assistance to the user of this class of equipment. The opinion is held that should the press maker publish some comprehensive data that will tell what the user may safely expect his equipment to do, the user's tendency will be toward putting more of his jobs under a ram.

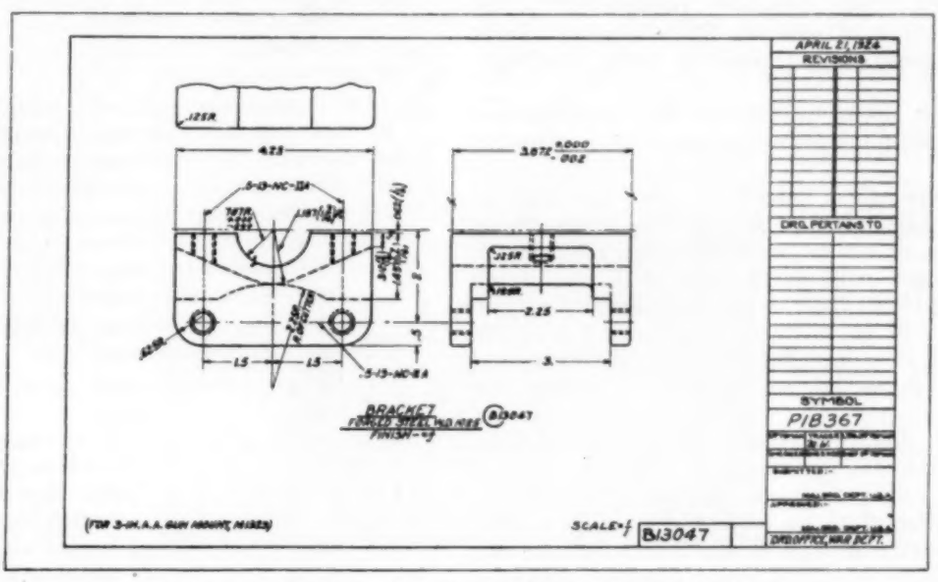
Dimensions for Drawings

A Request for Information

Why standard practice in dimensioning drawings is vitally necessary—How the Ordnance Department, U. S. Army, is dimensioning its drawings—What changes, if any, should be made?

IN 1917, the Ordnance Department of the U. S. Army was called upon to secure large quantities of munitions of war. Orders were placed all over the country; in many instances several different plants were called upon to manufacture identical commodities. The drawings furnished in many cases were those that had been used for a considerable time by government shops, or arsenals, without serious question.

Soon difficulties began to make themselves apparent. The correctness of the drawings was seriously questioned. The government inspector and the contractor found themselves unable to agree as to the proper interpretation of the drawings. Furthermore, seldom did two different contractors for the same material agree as to what the drawings meant. It soon became apparent that something was wrong and needed immediate attention.



Ordnance Department method of dimensioning drawings

In some cases the drawings were altered in accordance with a contractor's recommendations. Even this did not seem to cure the ill. Again, a dozen contractors were manufacturing the same components. All of them were agreed that the information on the drawings, and also the methods used to express this information, was far from proper. When a conference was called to settle the matter, no two of them could agree as to the proper method of correcting it.

The experience brought the matter of the dimensioning of drawings very forcibly to the attention of the Ordnance Department. What is the proper method of dimensioning? And why? Are there several methods equally good? Is so, should one method be used to the exclusion of the others, or should several be used? If more than one method is used, where should the one be used and where should the others? Is there any generally used commercial practice for this? If so, what is it?

The Ordnance Department is searching for answers to all of these questions. It is a very vital factor of preparedness to have the drawings of this department in accordance with the best commercial practice. In case of necessity, it is very essential that these drawings can be sent out and used without misunderstanding by every shop into which they may find their way.

One of the most important functions of a drawing is to convey sufficient information to the shop so that the parts represented can be produced in metal readily and satisfactorily. This does not seem such a difficult task. Almost every shop used drawings of its own make without much difficulty. We are apt to forget, however, that it is one thing for a plant to use its own drawings, over which it has its own control, and on which changes affect only the work in its own plant; while it is entirely another proposition to use drawings over which it has no control, drawings which are to be interpreted by outside inspectors as well as its own workmen, and drawings which are to be used simultaneously by several different organizations, all with ideas of their own as to what the drawing represents. As long as the Ordnance Department engineers made the drawings and used them only themselves, they had no trouble. It was when outside parties became involved that the many questions were raised. Complete information then had to appear on the drawing, as nothing could be left to the experience of the superintendent or foreman.

As a result of experience during the war, the Ordnance Department has adopted a certain definite method of dimensioning drawings which will be explained in

detail. To the best of its knowledge, this represents the best current practice. At this time it is appealing to the industry for confirmation of this belief or advice as to a better method. It is hoped that the industry will respond to this appeal. If this method is one that you use, or are willing to use, the Ordnance Department should know it. If not, they should know what should be used, and why. The *American Machinist* has offered its pages as a public clearing house for this information. If the industry will express a definite opinion on what standard practice is, the Ordnance office will be glad to adopt it.

The Ordnance Department is also anxious to have an opinion from industry on the best method of expressing tolerances to cover the manufacture of various types of instruments, of which a surveyor's transit might be taken as an example. In work of this character a certain fit is the ultimate object. These fits can probably not be obtained by the expression of any tolerances which are within practicable limits. At the same time, if quantity production is to be obtained, parts must be machined to certain tolerances, and thereafter used in selective assemblies, accompanied by special machining, when necessary. The Ordnance Department is up against the problem of securing interchangeable parts that will fit properly, and hopes to avoid needlessly fine tolerances.

The Drafting Room Regulations for the Ordnance Department contain the following instructions in regard to dimensions:

"31. All dimensions placed on drawings will be stated in decimals. Except in the case of shrinkage surfaces, gages, or similar work requiring the greatest accuracy decimals will not be carried beyond three places. Where 16ths, 32ds, or 64ths are used, the three-place decimal will be followed in parentheses by the vulgar fraction it is intended to represent. Whenever practicable to do so, the nearest 8th of an inch will be used.

"In writing vulgar fractions, the sign of division should be a horizontal, not an inclined, line."

The use of vulgar fractions was begun some years ago when it seemed to be commercial practice. The Ordnance Department is now inclined to believe that they should not be used, but would like the opinion of the industry on this point.

The information in regard to tolerances has been revised under date of Feb. 3, 1923. This revised information is as follows:

STANDARD PRACTICE FOR ORDNANCE DESIGNS

Tolerances

1. When determining the dimensions to prescribe on drawings of fitting members, other than surface fits, the nominal size is the base from which the dimensions are calculated. The nominal size or base is also to be prescribed minimum dimension of the external (female) member. This applies to parts specially machined to size and will not govern when using commercial parts, such as cold rolled shafting, standard nuts, etc., unless commercial practice so prescribes.

2. The dimension to be prescribed for the maximum internal (male) member is obtained by subtracting from or adding to the base, or minimum internal member, the amount allowed for fit, depending upon whether a clearance or interference fit is desired.

3. The difference between the minimum external member and the maximum internal member will be the minimum allowance for a clearance fit and the maximum allowance for an interference fit.

4. Variations in the size of work are to be tolerated in one direction only.

5. The minimum dimension of the external member and the maximum dimension of the internal member are to be prescribed on drawings. A tolerance of zero value will be applied minus to the prescribed, or minimum, dimension of the external member and plus to the prescribed, or maximum dimension of the internal member. Tolerances of predetermined value will be applied plus to the prescribed, or minimum dimension of the external (female) member, and minus to the prescribed or maximum dimension of the internal (male) member.

Examples:

1 in. nominal size. Clearance fit.
1. Base and min. external (prescribed on drawing)
.002 allowance for clearance (min.)
.998 max. internal (prescribed on drawing)
.003 predetermined tolerance.
1. +.003 prescribed dim. and tolerance for
−.000 external members
.998 +.000 prescribed dim. and tolerance for
−.003 internal members
.002 minimum clearance
.008 maximum clearance

1 in. nominal size. Interference fit.
1 in. Base and min. external (prescribed on drawing)
.003 allowance for interference (max.)
1.003 max. internal (prescribed on drawing)
.0015 predetermined tolerance for external member
.001 predetermined tolerance for internal member
1. +.0015 prescribed dim. and tolerance for
−.000 external member
1. +.000 prescribed dim. and tolerance for
−.001 internal member
.003 maximum interference
.0005 minimum interference.

As an example of the use of these instructions, a drawing of a bracket for a gun mount is reproduced. In your opinion is this part dimensioned properly? Would you undertake to make this part to the satisfaction of the Ordnance Department with no further information as regards the dimensions and tolerances than that given?

A Railway Telephone System in Trinidad

A Bulletin on the Railways of Central America and the West Indies recently published by the United States Department of Commerce, gives the following data on the telephone and telegraph systems of a Trinidad Railroad.

"The telephonic and telegraphic installations on the railway are inadequate. Most of the existing telephones have no bell communication, and whenever one station requires to speak with another, attention has first to be obtained on the telegraphic instrument. These telegraph circuits, with so many stations connected, are almost constantly engaged, so that it is often a considerable time before telegraphic communication can be established."

"The telephones are superimposed on the telegraph circuit wire, and on the same wire also phonophore instruments are connected. Whenever the phonophores are being used the conversation interferes with any persons who may be speaking on the telephone circuit, the phonophore conversation being overpowering."

Maintenance of Rolling Stock on New England Railroads

By Ellsworth Sheldon
New England Editor, *American Machinist*

The fifth article—Division shops at Thompson's Point—Roundhouses at Rigby—Repairing locomotives and cars for two railroads—The Portland Terminal Company

THE Portland Terminal Co. maintains a division shop at Thompson's Point, Portland, Maine, and a large roundhouse and shop in the adjoining town of Rigby. The work of the latter shop is confined mostly to minor repairs upon the locomotives of the Boston & Maine Railroad, while the plant at Thompson's Point takes care of classified and general repairs on Boston & Maine and Maine Central engines. The latter plant includes a considerable shop for the repair and rebuilding of freight cars. Besides maintaining these shops for the convenience of the above mentioned roads, the terminal company has several locomotives of its own to handle traffic through the city of Portland.

While the Thompson's Point shops are not as large or as completely equipped as the main shops of the Central road at Waterville, they are nevertheless amply capable of handling the general run of classified repairs on all types of engines owned by the road, including the Mallet compounds that are used to some extent on its mountain division.

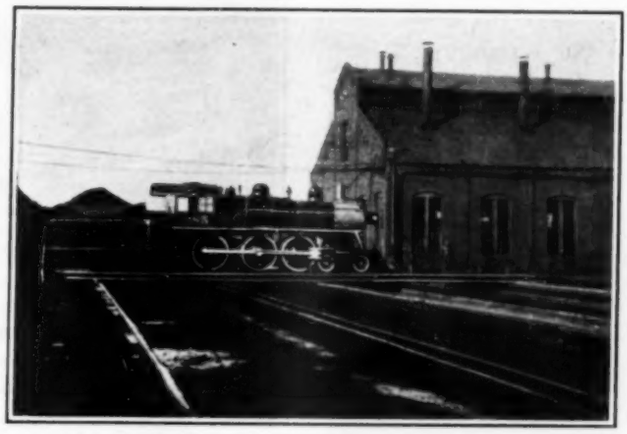


Fig. 1—The transfer table at Thompson's Point

The pit of the transfer table, shown in Fig. 1, lies between the locomotive shops on one side and the car shops on the other. Beyond the car shops are the roundhouse, turntable and distributing tracks of the yard, from which spur tracks extend in either direction to the main line of the mountain division. The building to be seen in the background of this illustration is the blacksmith shop.

For unwheeling and wheeling locomotives, the shop has a long drop-pit with a table running the full length. This table is supported by twelve screws approximately 4 in. in diameter, which revolve upon roller thrust bearings and are driven by an electric motor through spur and bevel gearing and universal jointed shafts. Though the machinery for this table was originally purchased, and was once driven by belt from the line shaft, it has been entirely rebuilt in the shop and all of the mechanism is now concealed beneath the floor.

The length of the pit is such that most of the standard types of engines in use upon the road can be unwheeled in one operation. After spotting the engine, timbers are passed under the frames and supported by blocking at the sides of the pit. Yoke binders and cellars are then removed, the gear necessary to be disconnected is taken off and the table lowered; leaving the engine resting upon the timbers. The wheels are then rolled to one end and lifted out of the pit by raising the table to its normal position. At the same time dolly trucks have been placed in position on the table so that when it returns to the surface the engine is lifted from the timbers and it can be shifted on the dollies to some other track.

Even the Mallets can be unwheeled on this pit, though it is a "two-operation" job. The engine is first spotted head-on and the wheels removed from the forward unit as in the case of a single locomotive. With this unit on dolly trucks the engine is then towed to the turntable, turned around and run backwards on to the table of the pit to get the wheels out from under the rear unit.

It is the customary practice of the Maine Central road to reface worn driving boxes with bronze and worn wheel hubs with cast iron. Fig. 2 shows how the renewable disks are made in two parts, set into the recessed hubs and fastened with bronze countersunk-head screws. When these screws are made, the bar is necked down behind the head to a diameter somewhat smaller than the body size of the screw so that continued effort applied to the wrench by which the latter are set up will twist off the bar. This is an excellent method of applying screws, the heads of which must be below the surface, but after the bar twists off the screw cannot be removed without destroying it. Hence everything must be right the first time.

The channels of the driving boxes in which the shoes and wedges bear are also resurfaced with bronze, and in Fig. 3 may be seen one of the larger boxes set up

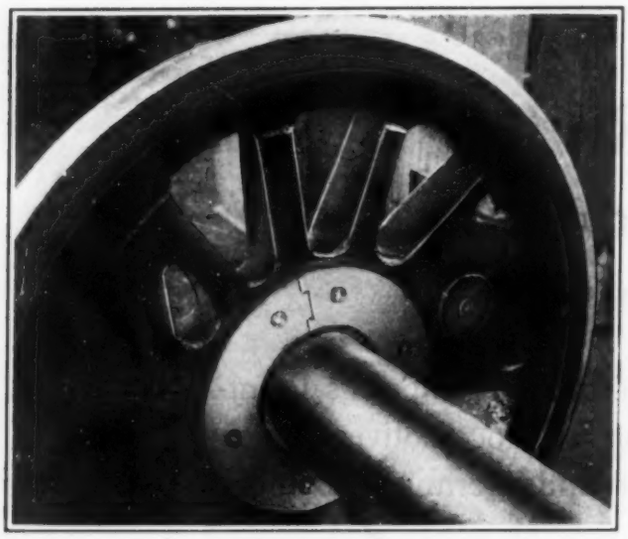


Fig. 2—Driving wheels refaced with cast-iron disks

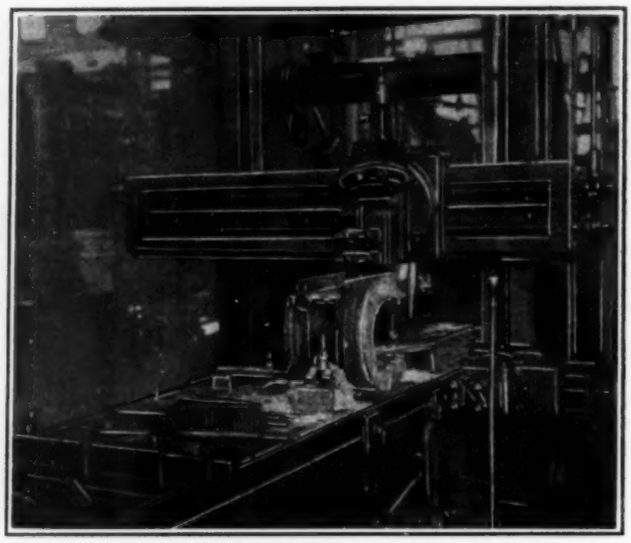


Fig. 3—Replaning a driving box

on a planer to refinish this surface. The facing is usually squared off in a boring mill at the same time that the crown brass is bored to diameter. The boxes are shipped to Waterville to have the new facings poured, as there is at the latter place a very complete equipment for doing this work.

Acetylene and Electric Welding

As in all railroad shops, the acetylene torch has become an indispensable tool. It is used for cutting and welding on tank work, for some parts of the boiler work, and for building up worn pistons, guides and other parts so that they may be remachined to their original dimensions. The electric arc welding process is also used for similar purposes.

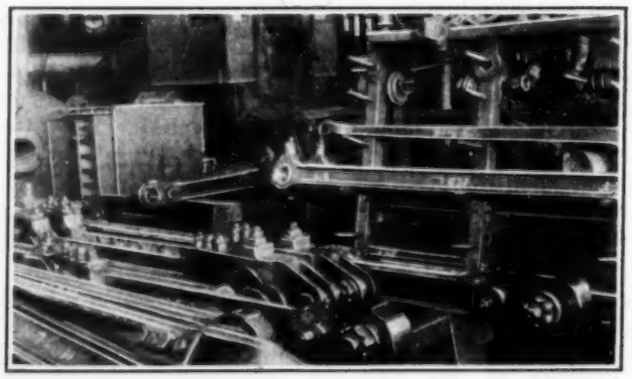


Fig. 7—The rod and valve department

Fig. 4—Pre-heating a car axle for welding

Car axles are subject to rapid wear upon the flanges outside the journal boxes, and these flanges are restored by the electric welding arc. Before starting the weld the axle is heated in a charcoal fire as shown in Fig. 4. When one end is heated, the axle is reversed in the fire and the welder proceeds to build up the flange while the other end is heating.

A rather unusual job of building up by means of the

Fig. 5—Piston rod built up by electric arc

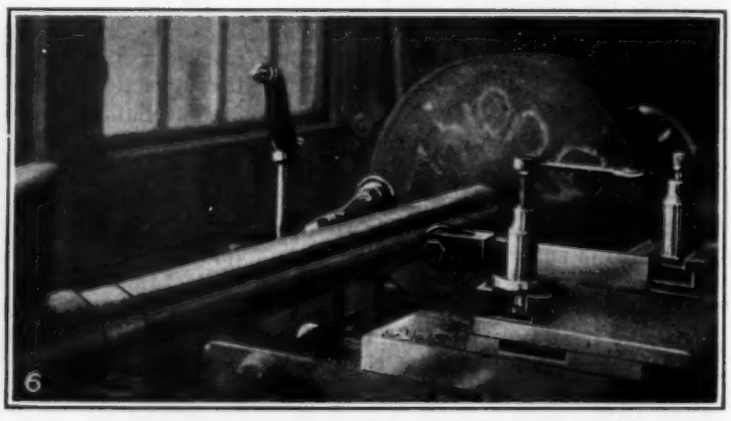


Fig. 6—Rolling surface on piston rod

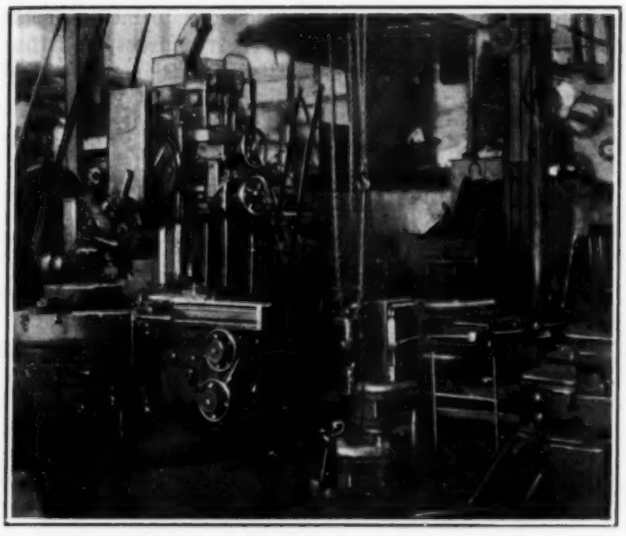


Fig. 8—Boring mills and part of erecting floor

arc is shown in Fig. 5. This is the tapered end of a piston rod that had been damaged by working loose in the crosshead. Having built up the rod about ⅛ in. all around, the crosshead can be rebored and the rod fitted to it as tightly as a new job.

Redressed piston rods are rolled to a smooth surface by the tools shown in Fig. 6. There are three of the rollers, two being held in an equalizer that is in turn supported in a bracket clamped to the bridge of the carriage behind the cross-slide of the late. The third roller is held in the tool post. By this method the strains are abosrbed in the lathe-carriage and are not transmitted to the centers. Note the means of driving the work with a key in the slot at the tapered end and a yoke-stud in the driving plate.

One corner of the machine shop bay immediately adjoining the erecting floor is given over to rod and valve work, air-brake repairs, gages, whistles, bell-ringers and similar parts. Fig. 7 shows main and side rods to which new bearings have been fitted, waiting to go back to their respetcive engines. As soon as an engine has been rewheeled on the drop-pit at the other end of the shop it is shifted to a track adjacent to this department to have the small parts fitted and the valves reset.

Another part of the floor where are located the boring mills for boring and facing driving boxes, boring car wheels and similar jobs is shown in Fig. 8. The piece on the mill in the background is an eccentric for a Stevenson valve motion. The boring mill equipment does not include anything large enough to bore driving-wheel tires, as most of this work is handled at Waterville, but it may be done in the driving-wheel lathe if necessary.

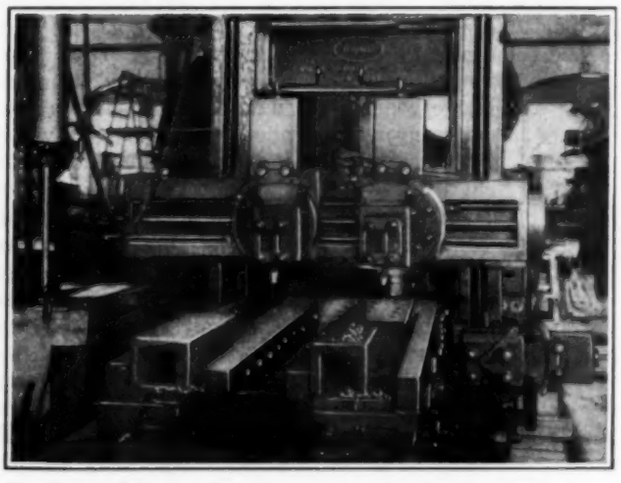


Fig. 9—Fixtures for planing driving box shoes

In Figs. 9 and 10 may be seen some fixtures designed to expedite the work of planing driving-box shoes, crosshead-guides and similar parts. These fixtures are bolted to the planer table and are plentifully supplied with setscrews which, supplemented by the usual form of "finger," familiar to planer hands, serve to locate and hold the work. As these fixtures are finished in position they take the place of both planer vise and straight-edge, and can be depended upon to produce parallel work.

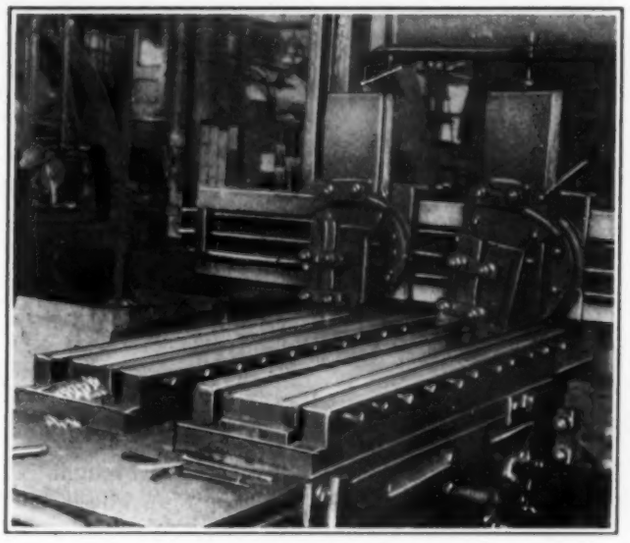


Fig. 10—Planing crosshead guides

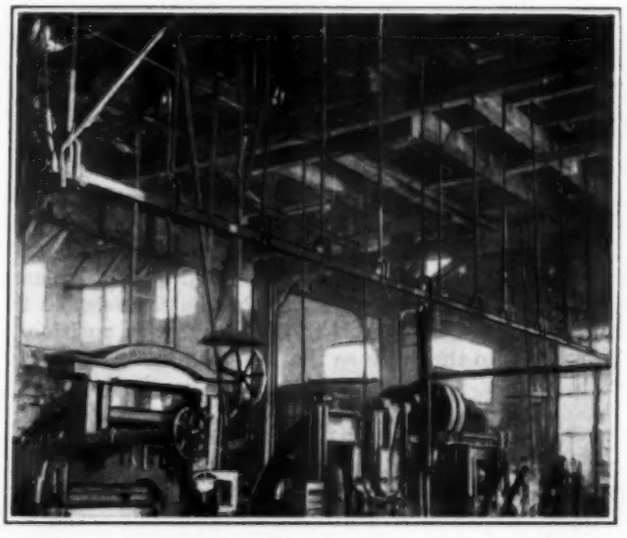


Fig. 11—Trolley and air-hoist to serve the planers

The erecting floor is served by a Shaw bridge crane of 15 tons capacity, but the machines in the bay depend upon chain blocks and air hoists. Fig. 11 shows a double trolley rail suspended by bolts and shackles from the overhead works. A chain block or an air hoist may be hung on the hook of the trolley and thus made to

serve the planers and one or two of the larger lathes in the adjoining group.

The driving-wheel lathes, forcing presses and other machines that involve the handling of heavy parts are located at one end of the erecting floor where they can be served by the bridge crane, which runs the whole length of the building.

In Fig. 12 may be seen a device to assist the operators to handle carwheels and axles into and out of the forcing press. The press stands parallel to the

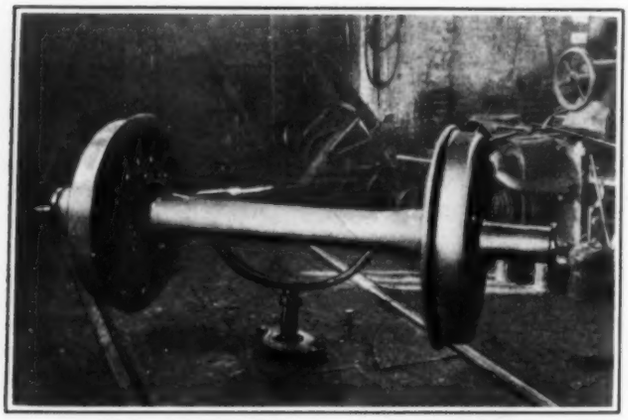


Fig. 12—Device to handle car wheels and axles

service track upon which the wheels are brought into the shop, and this means that a pair of wheels must be swung around a quarter-turn both coming and going.

The device consists of an air-brake cylinder set in a pit between the rails in line with the press. The upper end of the piston rod is provided with a yoke, fitted to swivel on the rod and shaped to suit the axle. The air valve is below the floor and is controlled by two plungers which extend through the planking and terminate in flat-topped buttons, one of which may be seen in the illustration.

With a pair of wheels over the device and the yoke lined up with the axle, the operator steps on the proper controlling button, and the load is lifted as shown in the picture. In this position the pressure is on the piston and the load remains suspended as long as may be desired. Pressure upon the other button releases the air and lowers the wheels to the track or in position to be rolled into the press as the case may be.

"Free Hand" Drafting

BY JOHN F. HARDECKER

When we speak of drafting, we invariably conjure in our minds a picture of a long board with an eye-shaded draftsman bent over it, busy with T-square, triangles, protractors and all that sort of thing. That's quite the orthodox conception and it's still a true one in the vast majority of cases. But as the need keeps increasing, there's gradually creeping into the picture, the draftsman with the pad of paper and soft pencil, who can sketch mechanical ideas free hand. For quick-development work or emergency cases to keep the shops moving, it's almost essential to have such a man, since the time required to make a strictly mechanical drawing would be too great. These "free hand" draftsmen are almost exclusively the result of personal development—men who have a natural aptitude or knack for this kind of work. Yet, since this is a growing need, would it not be well for our schools and colleges to include some of this "free hand" drafting in their courses, and thus fit their graduates for greater usefulness in the field of engineering? It surely would be well worth while.

America Makes Inroads in the Netherlands Machinery Market

One of the outstanding features of the review of the Netherlands industrial machinery market is the contrast between American gains and German losses during the last two years, according to the Industrial Machinery Division of the Department of Commerce.

In spite of the German advantages of proximity to the Netherlands market and close acquaintanceship with the Dutch customs, Germany has failed to regain its pre-war machinery trade in this direction. German machinery exports to the Netherlands amounted to 13,373 metric tons in 1924, as compared with 15,594 tons in 1923 and 31,201 tons in 1922. Pre-war shipments in 1913 totaled 22,884 metric tons, or more than 9,500 tons above those of 1924.

On the other hand, the United States exports of machinery to the Netherlands aggregated $764,179 in 1924, as against $866,988 in 1923, and $691,696 in 1922. This drop of approximately $100,000 in 1924 from 1923 figures was due to a lessened demand in general, but the growing importance of this market to American exporters is reflected in the fact that the 1924 purchases exceeded those of 1922 by nearly $75,000, and that reasonable potentialities are in evidence.

In 1922, Germany sold metal-working machinery amounting to 4,631 metric tons to the Netherlands, exceeding the 1913 figure by about 1,000 tons. Shipments of this equipment declined to 2,301 tons in 1923 and to 1,806 tons in 1924. The Netherlands was Germany's chief market for woodworking machinery in 1922 absorbing 2,083 metric tons, but dropped to fourth place among world markets for German machinery in 1924, buying 634 tons of this equipment.

Germany's largest exports of cranes and excavating machinery went to the Netherlands in 1922 and 1923, but in 1924 the Netherlands occupied fifth place as a buyer of excavators and third place as a market for cranes. Sales of excavating machinery decreased from 602 metric tons in 1922 and 1,010 tons in 1923 to only 68 tons in 1924. Shipments of German cranes to the Netherlands declined from 1,743 metric tons in 1922 to 593 tons in 1923, and 191 tons in 1924.

The situation in the Dutch machinery market is another example of the lessened ability of German machinery manufacturers to compete successfully in world markets. The American gains and German losses in machinery sales in the Netherlands in the last two years should be of interest to the American machinery manufacturer in considering the competing ability of German machinery. Markets such as the Netherlands and other countries in close proximity to Germany have been so long thought to be particularly promising fields for the sale of German machine equipment that opportunities for American participation in this trade may have been neglected. The advantages of increased sales effort in the Netherlands and the possibility of a further increase in the demand for American machinery in that market are questions to be seriously considered by the American machinery exporter.

Analyzing the "How" of a Job

By K. H. Condit
Editor, *American Machinist*

Analysis of an operation cycle into its elements or "therbligs"—What the therbligs are and how they are symbolized—An example of operation cycle analysis

HAVE you ever stood beside an expert press operator and wondered at the speed and precision with which he fed pieces to the dies? Each motion of his hand is exactly timed and each cycle of motions almost identical with all the other cycles. Automaticity is so perfect that the man is practically a part of the machine. His motions are so rapid that the eye cannot analyze them, yet they must be capable of analysis. If they are, it may be possible to eliminate some of them and by so doing reduce the time of the cycle, the fatigue of the worker and the cost of the product.

Just such analyses have been made of many shop processes by the late Frank B. Gilbreth and his engineers and some of the results of the studies have been astounding. The machinery used in making the analysis will be described later. In this article I want to bring out the theory of motion study for which Mr. Gilbreth was responsible and which is readily applicable to everyday jobs by any manager, foreman or workman who will take the trouble to think about it and grasp the basic principles.

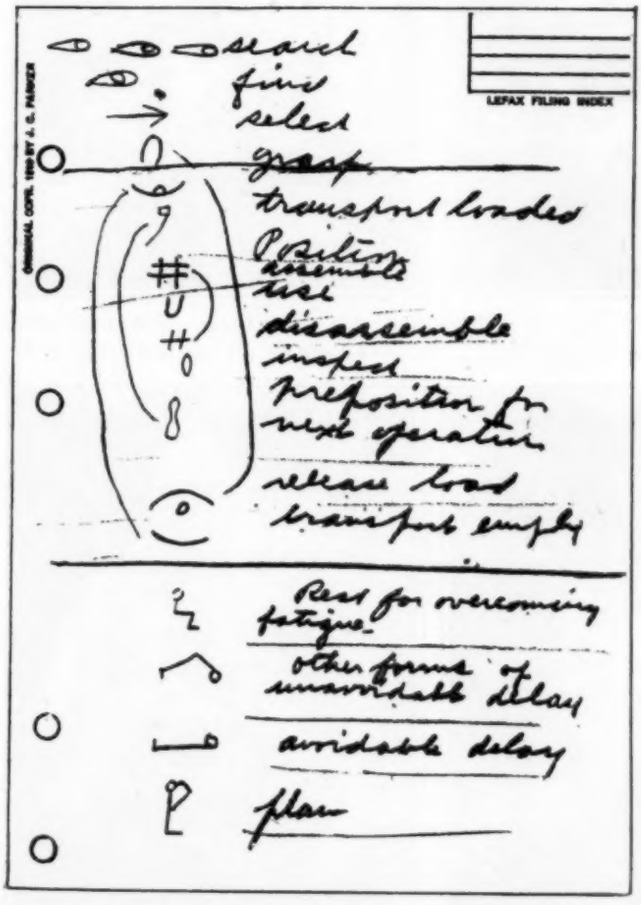


Fig. 4—The Gilbreth "therbligs" and their symbols as sketched by Mr. Gilbreth for the author

According to Mr. Gilbreth business, or industry, consists of processes. The processes may be divided into operations. The operations consist of cycles of motions and the cycles are made up of what he called "therbligs" or elementary motions. Each therblig may be affected by any or all of the variables mentioned in the previous article.

Generally speaking, an operation may be considered to consist of three items: (1) Move; (2) Do; (3) Inspect. Or, put somewhat differently: (1) Get ready; (2) Do it; (3) Clean up. In his analysis of motions Mr. Gilbreth went considerably farther than this, finally naming sixteen therbligs as the complete list of elementary motions, which he used for years. A seventeenth therblig, "Plan," was added comparatively recently. The sixteen therbligs are:

1.—Search
2.—Find
3.—Select
4.—Grasp
5.—Transport loaded
6.—Position
7.—Assemble
8.—Use
9.—Disassemble
10.—Inspect
11.—Pre-position for next operation
12.—Release load
13.—Transport empty
14.—Rest for overcoming fatigue
15.—Other forms of inavoidable delay
16.—Avoidable delay.

When a job is analyzed the therbligs may or may not include all those listed and the ones presented may or may not occur in the order set down here. Obviously, the job consisting of the fewest therbligs will be the most efficient and economical. It is the task of the motion study man, therefore, to analyze the job into its therbligs and then see how many of them can be eliminated altogether or, if that is impossible, combined with others.

There is no question but that nine men out of every ten in a shop have done some motion study without per-

Fig. 8—"Search." The machinist is hunting for his scale

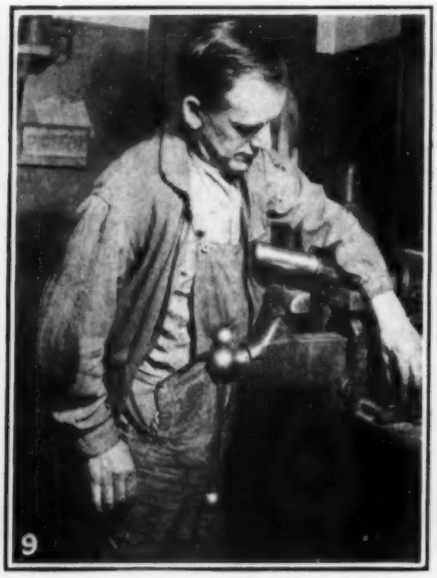


Fig. 9—"Find." If it is in the regular pocket search is unnecessary

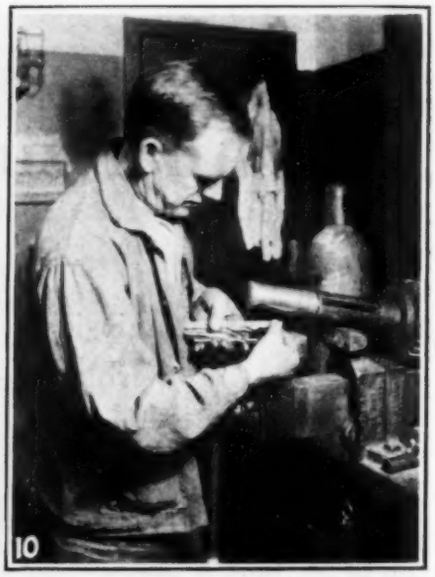


Fig. 10—"Select." If other items are in the pocket a selection must be made

Fig. 11—"Grasp." The fingers take hold of the scale

Fig. 12—"Transport loaded." The hand carries the scale to the work

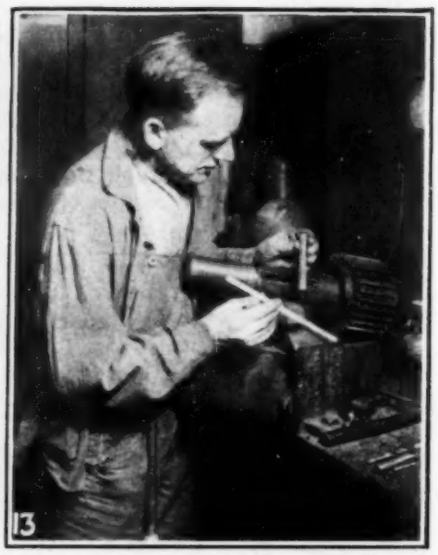


Fig. 13—"Position." The scale was wrong end up. It had to be reversed

Fig. 14—"Assemble." Scale and work are brought together

Fig. 15—"Use." The key is measured by means of the scale

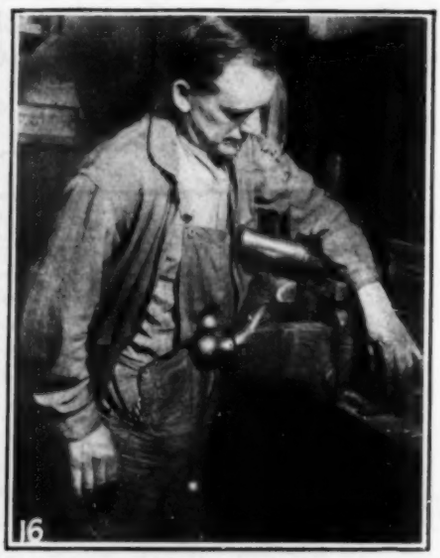


Fig. 16—"Release load." Scale from one hand, key from the other

haps realizing that their attempts to save time, reduce fatigue, or cut costs might be dignified by such a name. The point I want to emphasize is that much better and quicker results will be secured if the method of attack itself can be simplified so that there are no lost motions in getting at the information desired, and so that data already available can be applied to solving the immediate problem where difficulties exist similar to those that have been overcome before.

The great problem in the early motion study work was the procuring of means to record and measure the various motion cycles to be studied. All sorts of more or less crude arrangements were devised and discarded until finally Mr. Gilbreth hit upon the motion picture camera. By its use he was able to make records that could be studied in the office, records that were permanent and therefore useful at any time in the future for further study or for comparison with other records.

An enthusiast on waste elimination, Mr. Gilbreth devised a shorthand method of designating his therbligs on a chart. The symbols are given in Fig. 4 which is a reproduction of a leaf from his notebook sketched in pencil for me at my last interview with him. A brief explanation of the symbols may serve to outline their use to the uninitiated reader.

The symbol for search shows an eye looking to one side as it searches. The eye looking straight ahead signifies that the object has been found. The arrow is used for "select." "Grasp" is indicated by an inverted U meant to represent a thumb and forefinger picking up something. "Transport loaded" is symbolized by a curved palm carrying an object, Fig. 5; "position," by a sort of elongated comma. Four straight lines put together indicate "assemble" (see also Fig. 6), and a letter U stands for use. For "disassemble," one of the lines has been removed from the "assemble" symbol. A lens, stood on end, means "inspect." A sort of dumbbell is used to represent "pre-position for next operation" and the "release load" symbol is the "transport loaded" symbol inverted and with object falling away from it. "Transport empty" shows the original curved palm but without an object, Fig. 7. The little man in a sitting position is resting to overcome fatigue. Unavoidable delays bend him over on his head and toes while avoidable delays or "soldiering" are indicated by his recumbent position, flat on his back—in other words, "lying down on the job." The thought underlying the "plan" symbol is obvious.

An Example to Show How Simple the Elements of Motion Study Are

All this may sound complicated but in reality it is very simple. Suppose that you want to take a steel scale from your pocket to measure a key for a keyway. If you don't keep the scale always in the same pocket you have to search for it. If it is always in the same place you "find" it automatically and one therblig has been eliminated.

Now, if several other articles are in the same pocket with the scale you have to "select" the scale from among them. If the scale is the only object in that pocket you can "grasp" it without selection—another therblig gone.

The next therblig consists of transporting your hand loaded with the scale from your pocket to the key. Then you may have to "position" it because you have it by the wrong end. You "assemble" by placing the scale alongside the key and you "use" by comparing the diameter of the key with the graduations on the scale.

"Disassembling" consists in taking the scale from the key and in this operation you will probably find "inspect" unnecessary and replace it by "transport loaded" as you return the scale to your pocket. "Pre-position for next operation" might be accomplished by returning the scale so that when next you take it out you will have it by the right end ready to use. You "release load" by dropping the scale in the pocket and "transport empty" your hand away from the pocket. "Rest" and the two forms of delay are of little importance in such an operation, and the same may be said of "plan." A series of posed photographs to illustrate some of the therbligs is shown in Figs. 8-16.

Fig. 5—"Transport loaded." Fig. 6—"Assemble." Fig. 7—"Transport empty"

In these pictures, which attempt to illustrate the cycle of motions described above, the difficulty of determining just where one therblig ends and the next one begins is apparent. At the same time, this very difficulty is a blessing in disguise because it indicates how easily therbligs may be combined to reduce the total time of the whole cycle.

In an action as simple as the one just described there is of course little chance for motion study although I have suggested how three therbligs could be eliminated without effort. In this case the motion cycle is likely to be performed infrequently and consequently no very high degree of automaticity should be looked for. On a repetitive operation, on the other hand, every therblig eliminated or combined with another one will result, at the end of a day, after the operation has been completed hundreds or thousands of times in a very respectable saving in cost and effort. If you don't believe it, try it.

In what has been written here I have tried to explain the principles of motion study in the most elementary fashion. My object in doing so is to get more men in the shop to think along motion study lines. Mr. Gilbreth realized the vital importance of educational work in this direction and did everything he could to further it. It is my conviction that much good can come from sane motion study—consequently this attempt to interest more men in it. For those who want to make a real study of the possibilities of motion study Mr. Gilbreth's books, "Motion Study," D. Van Nostrand Co., and "Advanced Motion Study," and "Fatigue Study," the Macmillan Co. give the source material. Mrs. Gilbreth's "Psychology of Management," Macmillan, should also be mentioned in this connection.

Welding Cast Iron with Bronze

By S. W. Miller
Consulting Engineer, Union Carbide & Carbon Co.

AT FIRST sight, welding cast iron with bronze, does not seem a very promising process. The softness of bronze compared with that of cast iron, and the quite common thought that bronze is deficient in strength, would lead one to believe that the chances for success were small. But when we consider the facts we can easily see that there are good reasons for the great success and wide application of this method of joining cast iron.

The bronze used for welding is not a bronze with a copper-tin alloy, but a brass, or copper-zinc alloy. It is not ordinary brass but contains notable amounts of iron, manganese and tin, one or more of these elements being present. The iron strengthens the alloy, the manganese helps very much in making a sound weld, while the tin increases the fluidity. It is essential that aluminum and lead be kept out, as the former prevents the bronze from joining with the cast iron, while the lead makes a porous weld.

It is becoming more and more important to test incoming stocks of all rods, not only because of the growing ability of the welder to discriminate between good and bad, but for the fact that good welding necessitates good rods. Instead of taking anything offered as a rod, and suffering the consequences of poor work, the welder should insist on clean, smooth working materials of good physical property. While it may be necessary to vary the composition of the bronze to suit different purposes, it is not wise to have several different rods around a shop, unless each rod be clearly marked.

Advantages of Welding Process

The advantages of the bronze welding process are: first—its rapidity, second—only a small amount of preheating required, third—the ductility of the bronze absorbs and reduces to a safe point, welding strains that would cause breakage with cast iron welding, fourth—the usually greater strength of the bronze makes it possible to use only small amounts when the weld design is correct, and fifth—the low melting point of the bronze and its easy union with the cast iron, make it possible to apply without melting the iron.

The uses to which the process is suited may be divided into two classes; first, where strength is needed and second, where a bearing surface must be provided. In the first class would fall broken parts. For instance, it is now the usual practice to repair locomotive cylinders this way. When they were welded with cast iron, it was, of course, necessary to preheat to a high temperature, and in some places, such as the ports and passages, it was sometimes impossible to avoid cracking even with the cylinder removed from the engine. Such difficult work is now done rather easily with the cylinder in place. It is quite common to cut a piece from the outside of the cylinder to get at an interior defect, and, after the repair has been made, to weld in the removed piece, as broken domes in automobile cylinders are repaired. The amount of preheating is small, sometimes only requiring the heat of the steam from the cylinder.

The welding of cracked or broken cylinder barrels is made easy and rapid, because of the low preheating temperature. The cylinder cools rapidly after welding due to the bronze being so rapidly applied. Furthermore, the bronze will run into a smaller V than is needed for cast iron, requiring less welding metal. A 75-deg. V is all that is generally needed, even in thick castings. Any steam cylinder is designed for ease and certainty of getting a sound casting, rather than for a pure strength basis, this being especially true of locomotive cylinders. If it were only a question of resisting internal pressures, a cylinder 30 in. in diameter for 250 lb. of pressure would need a thickness of about ¼ in. They are usually made from 1½ in. to 2 in. thick, making the factor of safety large, and giving ample strength to a bronze welded joint.

A more recent application, is the bronze welding or jointing of cast iron pipe instead of using the common ball and spigot joint, which gave large leakage losses, especially when high pressure gas was being transported. Welded lines have been installed in a number of places, one being 23,000 ft. long and 6 in. in diameter, carrying city gas at 60-lb. pressure.

The usual method of fusion welding requires a V between the pieces joined, which is gradually filled up with the weld metal fused to the sides of the V during welding. Thus the strength of the welded piece depends on the strength of the union between the weld and base metals. Where bronze is V welded to ordinary cast iron, and the joint tested in tension, the break is always in the cast iron as it is the weaker. This is, of course, where the sections are equal. Any defect in the union makes the joint less efficient. When the V is filled up, the maximum tensile strength is had. It is possible to make a joint of greater strength than the cast iron, by using the shearing strength of the union between the two metals. There is no limit to the length of the weld and the shearing strength can be made as desired. The tensile strength depends on the thickness of the weld which can easily be made ample.

Presented at Boston Section meeting, American Welding Society.

Thermal Expansion of Aluminum and Various Important Aluminum Alloys

Scientific Paper, No. 497, of the Bureau of Standards, gives data on the thermal expansion of four samples of aluminum and 51 samples of important aluminum alloys. The preparation, chemical composition, heat treatment, etc., are included. Most of the specimens were examined in a range from room temperature to about 500 deg. C. Typical expansion curves of the various groups of samples are shown and discussed. In some cases, the data on expansion were compared with the equilibrium diagrams of binary alloys. After the expansion tests, the changes in length from the original lengths were determined.

A description of the apparatus used in this research and a review of the available information obtained by previous observers on the thermal expansion of aluminum and some of its alloys, are given.

The paper closes with a table showing the average co-efficients of expansion of the materials investigated over several temperature ranges. For values of individual samples reference should be made to the proper section of the text. The paper may be obtained by sending 15 cents to the Superintendent of Documents, Washington, D. C.

Helping Men to Develop Themselves

By William Davenport

Modern welfare work is free from the paternalism of the early attempts—Duty of the foreman in helping his men—Without his aid the best plan is futile

ACCORDING to the old theology and confirmed by the new psychology, man is a trinity—body, mind and spirit. So far as the material world is concerned the body is the all important thing. You cannot see a spirit or weigh a mind but the body is supremely evident in its operations and activities; and because of this fact it is the body with which we must deal in all the practical affairs of every-day life.

However, one other great truth must not be forgotten. While we cannot analyze fear or weigh hope, measure ambition or dissect love, these are the mighty turbines that generate the power for all the progress of our civilization; and whatever the body is or does will depend upon how these elements of human life function.

Any adequate fulfillment of destiny for the individual, then, will depend upon the fullest and most perfectly balanced development of his threefold nature, since it follows as a necessary corollary that this development eventuates in the highest material efficiency. So far as industry is concerned it is this corollary that needs to be studied. Society and the state are interested in the body, the school in the mind, the church in the spirit; but industry is interested in how the culture of all three work out in combination.

Eliminating Lead Poisoning

For example, the Sherwin-Williams Paint Co. made a rule in the dry-color department that every man must take a bath in the morning before going to work and change to a clean suit of underwear provided by the company. At quitting time he must change back to his own clothes. Before this regulation 20 per cent of the force were always ill from lead poisoning. After the plan was in full operation, this disease practically disappeared. Whatever the profit of this rule to the company, the gain to the worker and his family in better health and happiness can scarcely be overestimated.

The great seven-story Goodyear Hall of the Goodyear Tire & Rubber Co., dedicated to "Education and Fellowship," is an outstanding sample of this company's efforts to secure a higher grade of men and women in their plant, but the educational advantages to the employees are invaluable.

For many years the H. J. Heinz Co. has had an elaborate program of lectures, entertainments and recreations for their people. Beautifully laid out grounds, stained-glass windows in stairs and halls and many other features have made this plant so attractive to the spiritual desires of people that every morning the office is crowded with men and women seeking employment.

In each example cited here one element of development is not neglected at the expense of the others, but these illustrations are used merely to show the intelligent study that is being given to this subject by many of the large corporations of the country.

Every normal man wants to grow and achieve as great success as possible. That large numbers of them do not realize their full possibilities is because they do not know how. What we frequently attribute to indifference is more often due to ignorance. Those who fail do so because they do not know where their opportunities are. Under a mistaken impression, many workers look with suspicion upon all so-called welfare work as being purely selfish in character. While this may be true in some instances it is not generally the case today, and whatever may be the motive behind these activities, the benefit to the employee is just as great.

Example Better than Dictation

The first effort of the shop executive, then, in helping men to develop themselves, must be along the line of tieing them up to this "mutual interest" work in plants where it is being carried on. He can do much in helping them get the right attitude toward themselves, their families and the company. It will not be wise to work always by open declaration or command. Often by example, by subtle suggestion or by pointing out how others have benefited through these agencies it will be possible to arouse new interest and awaken new ambitions. As each new feature is introduced he should explain it to the men until they fully understand that it is not a question of philanthropy but production for mutual profit; and show them at the same time that it cannot be put over without the united support of every man in the organization. The value of this method of handling the situation is well illustrated by the following incident:

Not long ago a large plant in the middle west arranged with a competent oculist to have the eyes of all the men in the shop examined. Resentment at once developed, without apparent reason. Investigation revealed that a rumor had been circulated that the purpose of this examination was to discover the men whose sight was affected so that it might serve as a basis for the eventual discharge of those who had imperfect sight. The foremen were much surprised when this became known and also that in some unaccountable way it had not been explained to the men that arrangements had also been made to provide with glasses all who needed them at a price much below the figure they could be bought for in any other way. Just as soon as the

executives could explain the real purpose of this plan and each one went himself to have his eyes tested, all opposition vanished.

A large majority of plants, however, do not have any, or at best very limited organizations for mutual interest work, and it is in these that the executive has a splendid opportunity to render a helpful service that no one else can do. By his very attitude he can breathe an inspiring atmosphere of self-improvement. A good illustration of this idea is to be found in the campaigns frequently carried on by the Endicott-Johnson Co. For weeks during the winter season one year, every dead wall, bulletin board and telephone pole was covered with posters printed in bright red and bearing the slogan: "Improve What You Have Got." This idea was supplemented by other activities, such as lectures, conferences, movies, etc., all carrying out the ideas: if you have a home, improve it; if you have a voice, improve it; if you have a memory, improve it; if you have a record for certain production, improve it.

Promoting Pride of Work

Pride of work, either in quantity or quality, is often a strong incentive to self-improvement. This may be promoted by the use of various types of charts, by friendly competitions in which some simple awards are given, by frequent meetings in which the men are given an opportunity to discuss their work and in many other ways which local conditions and surroundings will suggest.

But in helping men to this three-fold development, nothing can take the place of close personal contact and frequent interviews. Such interviews need not be lengthy or time-consuming if they are well planned in advance. However, to make them effective the executive must be thoroughly informed on the subjects he wishes to discuss. He can plan for certain games and contests that will provide needed exercise and bring the men together in friendly rivalry; he can advise membership in clubs and gymnasiums; he can make suggestions about the workman's lunch and general diet; he can devise methods for improving sanitation. In order to do this effectively, he does not need to take a course in physical culture. The reading of a few small books which can be obtained at any public library such as, "The Body in Health," and "Making the Most of Life," by O'Shea and Kellogg, and "The Body at Work," by Frances Gulick Jewett, will equip him to give this counsel in a helpful way.

Losses from Sickness

It will be easier to understand how important this service is if we recall this statement by C. E. Knoeppel: "Each one of our 30,000,000 workers loses, on an average, nine days a year through sickness, causing them a monetary loss of $780,000,000. In other words, there is a loss in productive effort in the things which could be built of 270,000,000 days a year."

A great many of the men toiling in industry today are without the education to enable them to fill the place they long to reach. Some were compelled by economic necessity to leave school early, others may have been indifferent and a few may have been so deficient mentally as to make that education impossible. But whatever be the cause, today there are in every man's heart two desires. One is to retrieve as much lost time as possible and still improve and increase his intellectual possessions; and the other is that his children shall not enter life handicapped as he is. What more constructive work can a shop executive perform than to inspire, advise and guide the men under him to improve themselves and to secure for the children as broad and liberal an education as may be possible?

To do this effectively he must know and understand local conditions thoroughly. He should have at the call of memory all necessary information about continuation schools, night schools and special classes for foreigners. Especially should he familiarize himself with all possible opportunities for technical instruction in the immediate vicinity. The various correspondence schools offer an opportunity to the average man to recover lost ground. Despite all the newspaper jokes about them, the correspondence schools of the country have done a helpful and constructive work. Many a man can point to splendid advancement that has come to him through some such course of home study. And here it may not be a case of recommending a certain school, since the value of such studies depends upon the man rather than the school. But he should be familiar with the various courses given by the different schools and be ready to advise, encourage and direct any or all of his men in pursuing these studies.

Reading at Home

And when all these fail, there is still the opportunity for the operator to take up systematic reading and study by himself. With the free libraries available this will be without cost, and what can be gained by the plan will depend solely upon the will power of the man to keep up the reading until he has attained his object. But the foreman must know something of such reading courses and have the judgment to suggest the thing most likely to be helpful. If he feels his inability to outline a course of this sort, almost any library will be glad to render assistance by furnishing printed leaflets containing complete information. And the men whom he aids in this way will rise up and call him blessed.

In helping the spiritual development of his men every executive must exercise great care and diplomacy lest his purpose be misunderstood. Industry, with its personnel of every race and religion, is not interested in denominational affiliations or religious propaganda, but it dare not neglect in the development of the workers such items as honesty, integrity, truthfulness, fair play, meeting obligations, appreciation of nature, love of the beautiful, loyalty to the right, sobriety and a hundred other things that have to do with the finer side of human nature. Often such training may be combined with educational activities so that it will be effective and at the same time free from all appearance of propaganda. Meetings of various sorts, lectures, contests, entertainments and even the moving pictures may be enlisted in this work.

Such a program as this faithfully carried out must be helpful and make for the greater efficiency and happiness of the working force. No matter how elaborate the machinery or how wisely the work may be planned, the shop executive is still the key man and unless he gives it his unqualified support and renders his men his utmost service with warm-heartedness and sympathy, it will fail.

After all, the foreman is going to spend most of his waking hours in the shop. It rests largely with him whether those hours are to be pleasant and profitable for him and his men, or the reverse.

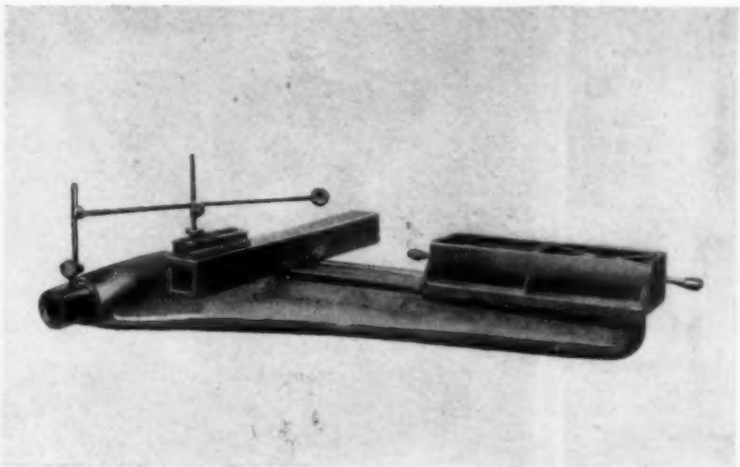


Fig. 1—Testing alignment of ways and trunnions

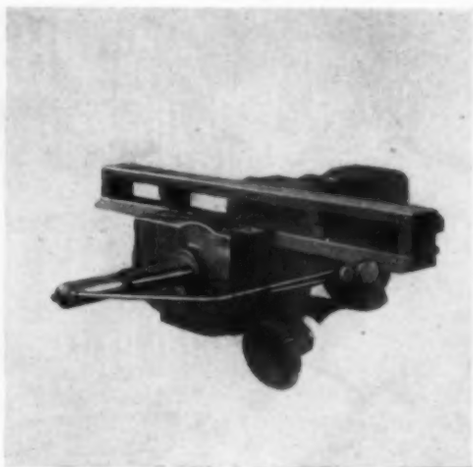


Fig. 2—Inspecting squareness of spindle

Inspection Methods and Gages Used in Building Radial Drilling Machines

THE illustrations show a few of the gages used for inspecting the accuracy of the workmanship that goes into the building of the radial-drilling machines made by the Western Machine Tool Works at Holland, Michigan.

In Fig. 1, the swinging radial-arm is being tested both for flatness and truth of the flat way on which the drilling head moves to reach holes in the work, at varying distances from the column, and for squareness with the trunnions that carry the arm.

The test shown is severe when the length of the hollow-square test bar is considered. With the bar laid across the working surface, the ends project nearly to the trunnions and multiply any inaccuracy many times. The surface gage, with its dial indicator, readily tests the relation of each trunnion to the ways and shows up very slight inaccuracies.

In a somewhat similar manner, the gage shown in Fig. 2 tests the squareness of the drilling spindle with the dovetail that fits the radial arm. A test plug fits the tapered hole in the spindle and carries the dial gage shown, on a rod bent to reach the test bar representing the radial arm. Swinging the gage from side to side tests the squareness very accurately.

Another test on spindle alignment with the sliding surface of the arm is shown in Fig. 3. The counterbalanced surface gage shown, is moved from one end of the bar to the other and checks the parallelism of the spindle and the surface by which the head slides on the arm.

For insuring squareness of the face of the main column with the housing that carries the trunnions on the swinging arm, the method of testing shown in Fig. 4 is used. Surface gages equipped with dial indicators, are used at each end and on both sides of the spindle. The trunnion housing is tested when at several different positions on the column.

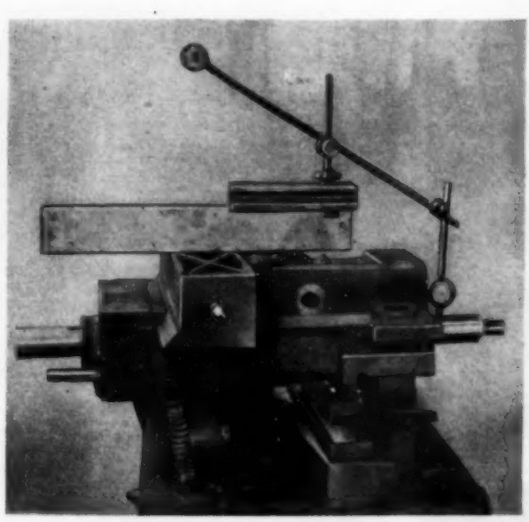


Fig. 3—Further inspection of head

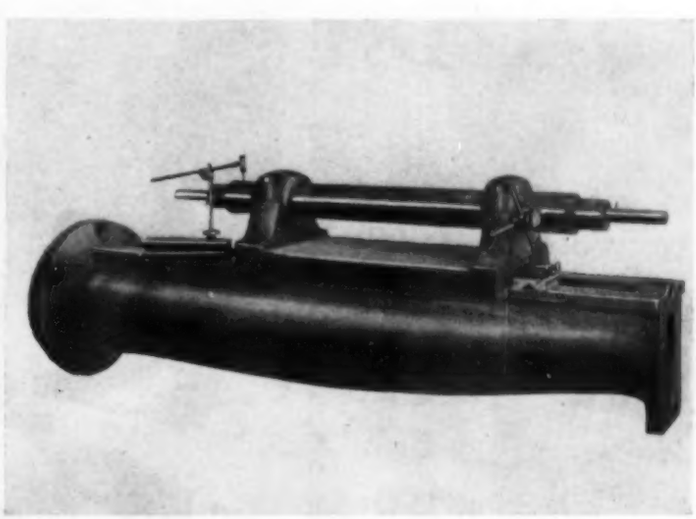
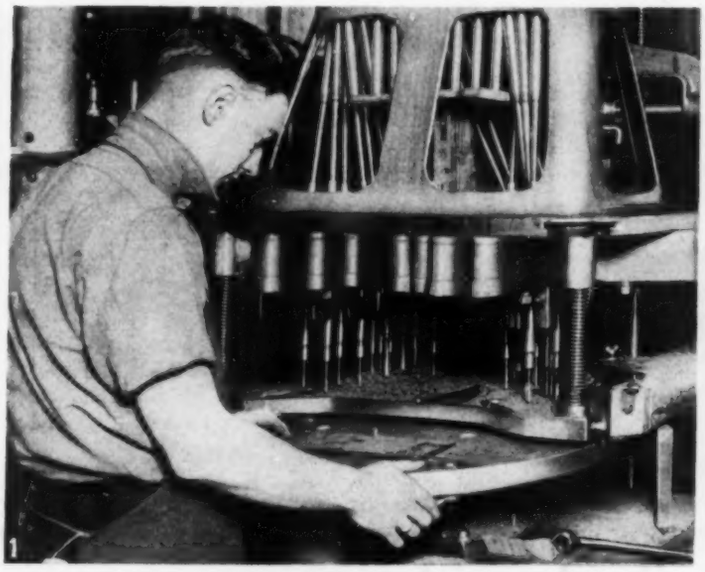


Fig. 4—Aligning ways and trunnion housing



Radio for the

1—Drilling standard panels—capacity 5,000 a day

2—Special panels are drilled with a templet

3—Automatically drilling 15,000 tube sockets a day

4—A corner of the panel engraving room

5—One of the automatic riveting machines —rivets 4 prongs on 2,500 sockets a day

6—Assembling transformers—each girl assembles 100 a day

Multitude

7—Winding inductance coils by hand

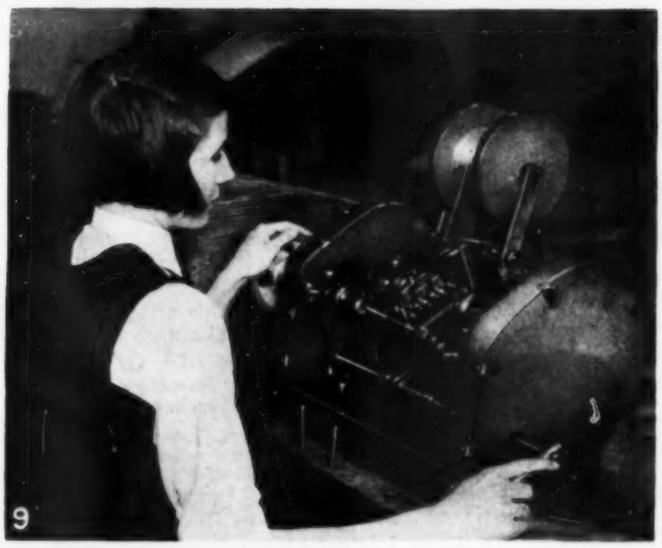
8—Testing book-type condensers

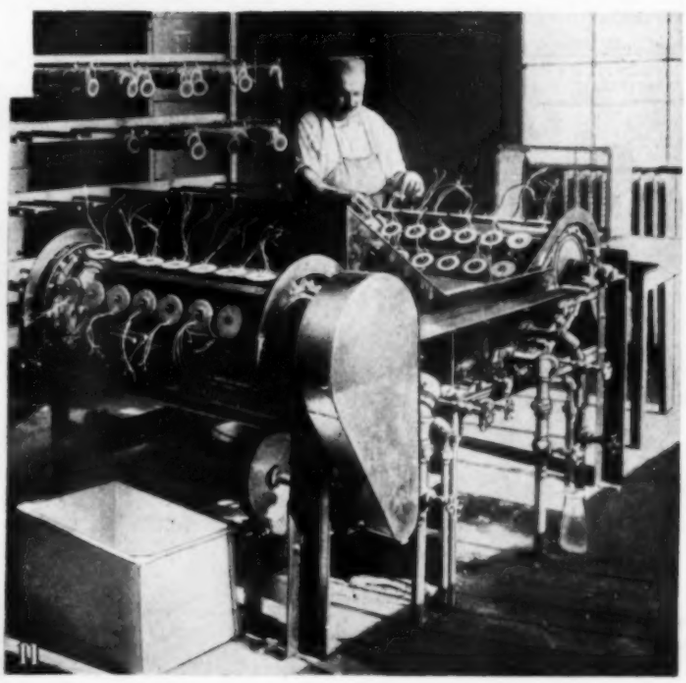
9—Winding resistance wire for rheostats—one machine winds 1,200 a day

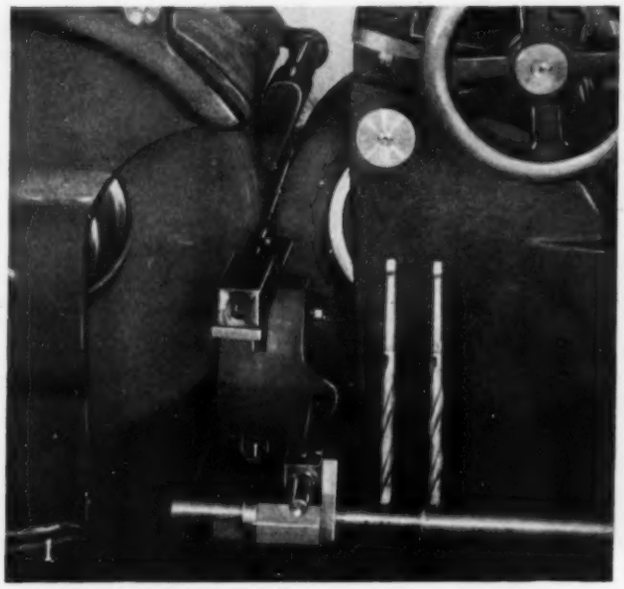
10—An automatic inductance coil winder—800 a day

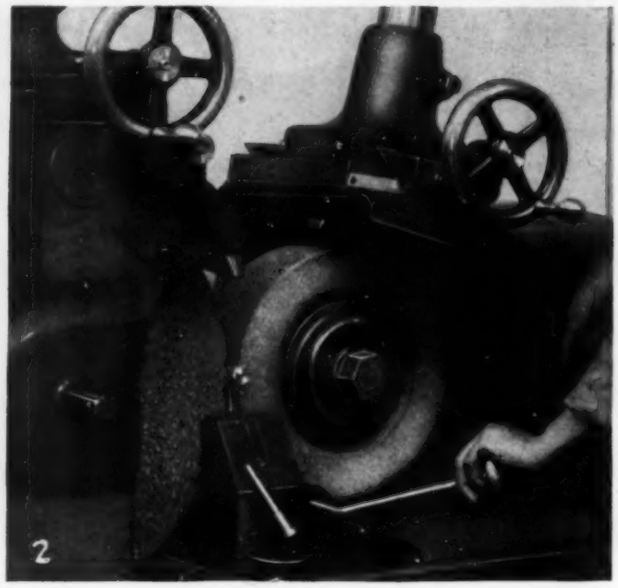
11—Waterproofing inductance coils on an automatic machine that dips them into a special solution

Photographs by courtesy of the Crosley Radio Corporation, Cincinnati, Ohio









Infeed and Through-Feed Centerless Grinding

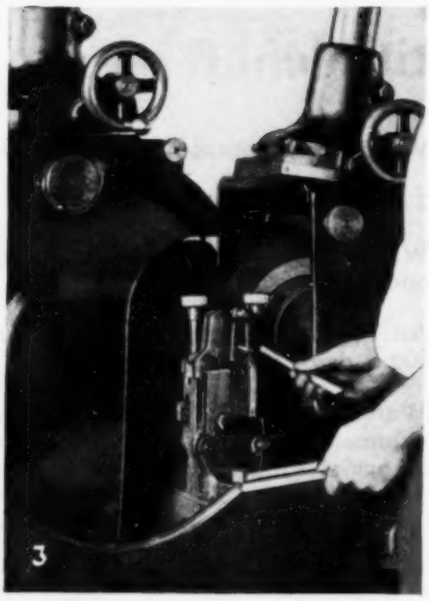
1—Grinding taper-shanks on twist drills. The bodies or barrels of drills are also ground by the infeed method, the wheels being dressed to give the slight back, or clearance, taper to the drills

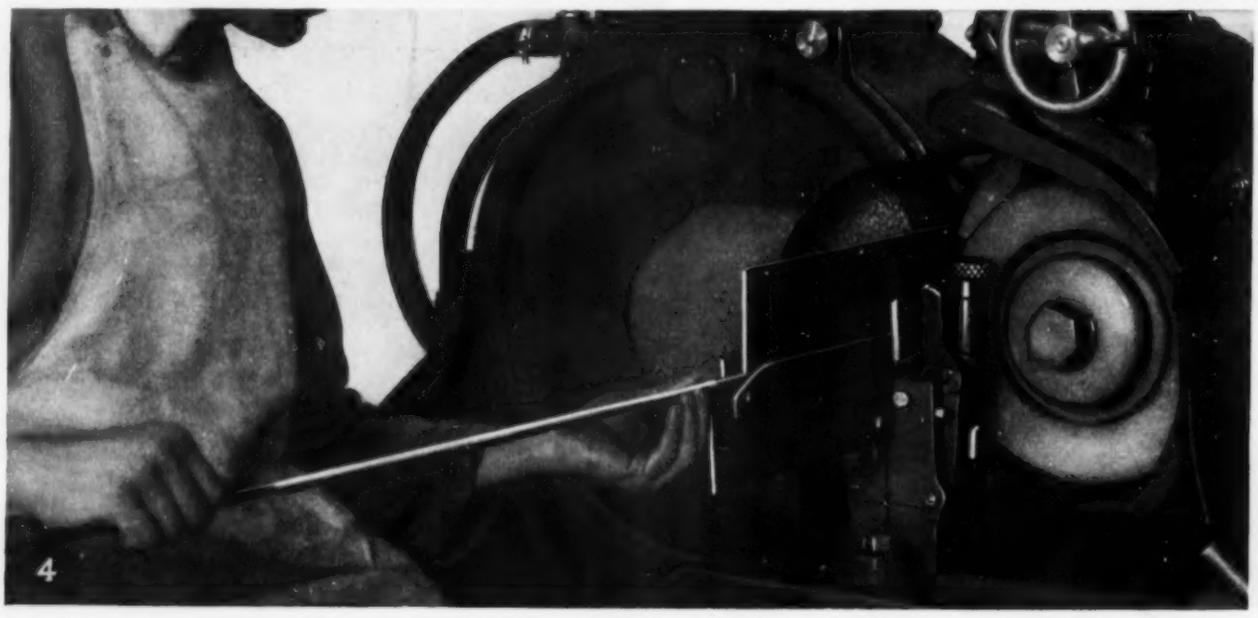
2—Infeed-grinding shafts with two diameters. Wheels are dressed with steps of proper diameter and length for both diameters of the shaft

3—Through-grinding small shafts. Note guides and support. Tolerance is 0.0002 in. on roundness and straightness

4—Grinding small disks, or rollers, 1/16-in. thick by 3/16-in. diameter. Disks are loaded into a tube and fed to supports as shown. Work guided on all four sides till it reaches wheel, then bottom and top. Disks pushed through tube with rod. Tolerance is 0.0001 inch.

Photographs by courtesy of the Cincinnati Milling Machine Co.





Automotive Production

At the Ansaldo Plant in Italy

By W. E. Irish
Associate Editor, *American Machinist*

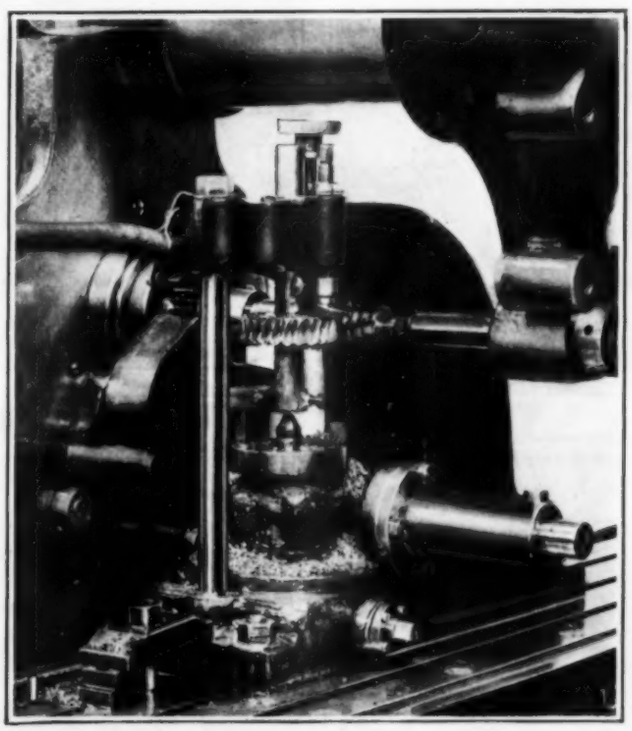
Cutting teeth in the steering worm wheel—A set of inspection gages—Operations on the connecting rod—Multiple milling machine set-ups—An engine-block boring jig

THE Società Anonima Automobile Ansaldo of Turin, Italy, was known throughout the war period as a valuable contributor to the needs of the Allies. At the close of the conflict, the company found itself confronted with the problem of changing over to a peace-time pursuit for which its war equipment could be made adaptable.

It is a credit indeed to its management, engineering and production staffs that it is today one of the leading automobile manufacturers in Italy. The company operates efficiently on quantity production principles at low cost, without any sacrifice to the high standards of quality which have been set.

The plant is equipped and organized on strictly modern lines and consists of a foundry, a machine shop and a body shop, with complete chemical and testing laboratories. Quantities of the best modern automatic machine tools, many of American manufacture, have been purchased and put to work. These new tools, however, did not entirely replace the equipment that was installed and used through the years of the war. One sees these war machines, therefore, standing throughout the shop alongside the new ones and performing efficiently, thanks to the thought and effort put on their tooling-up to make it possible for non-automatic equipment to serve a useful purpose.

These results have been attained largely by the use of jigs designed by the Ansaldo engineers and built in their shops.



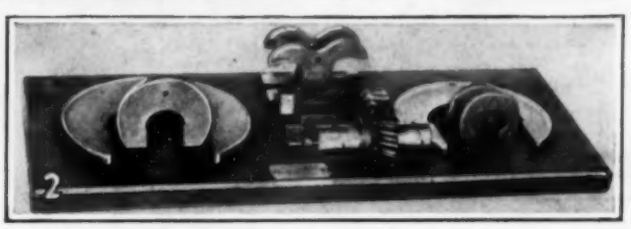


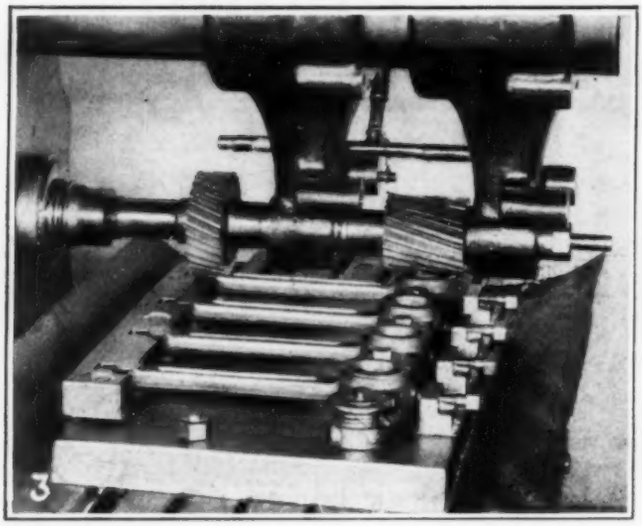
Fig. 1—Adapting the milling machine to cutting worm-wheel teeth. Fig. 2—The inspection gages

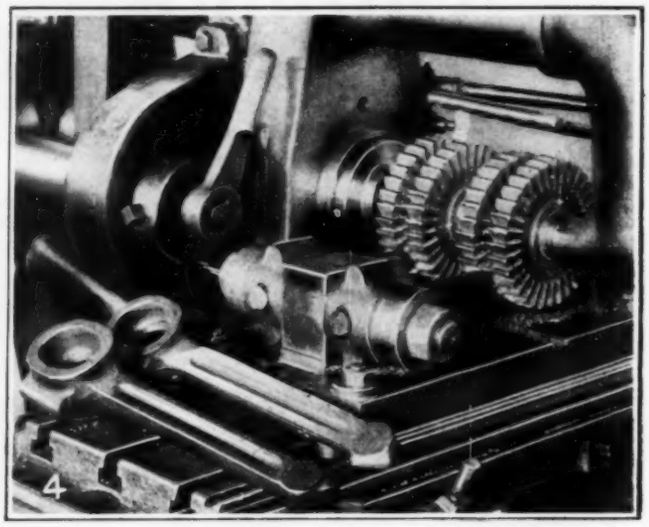
The design was worked out to make it possible on the one hand for one operator to care for a number of machines on the multiple set-up principle that keeps one machine on a cutting stroke long enough to set up and start several others. On the other hand, the design of the jig itself puts the determination of accuracy on it, rather than on the possibly worn bearings of the war-time machine in a good many instances.

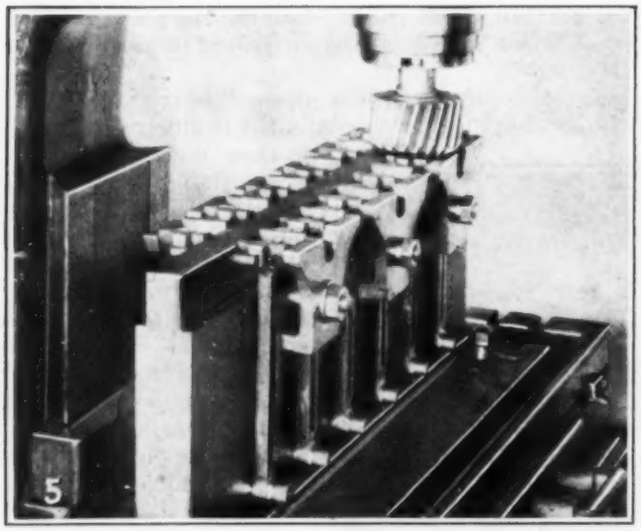
Often times, multiple set-ups are made without as much care being paid as could have been to keeping the intervals of "cutting air" to a minimum. The Ansaldo engineers, however, have not lost sight of this important point, as shown by the accompanying photographs. It is particularly well illustrated in Figs. 7, 9, 10, 11, 12 and 13, where, as can be seen, it would have been difficult indeed to have set the parts any closer together than they are.

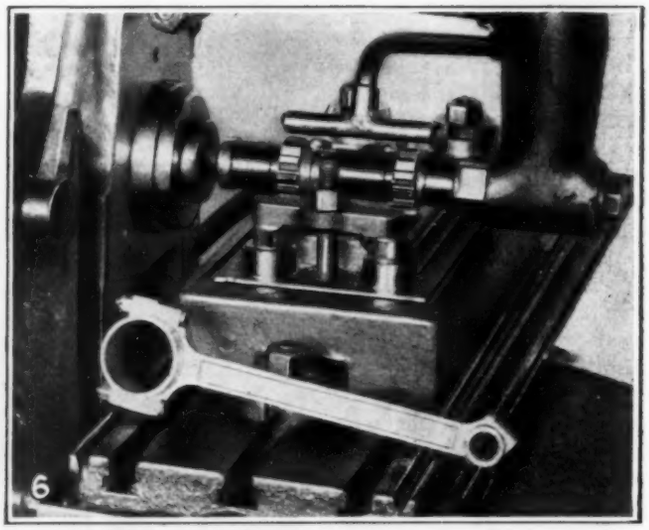
At the same time, judgment was used in deciding

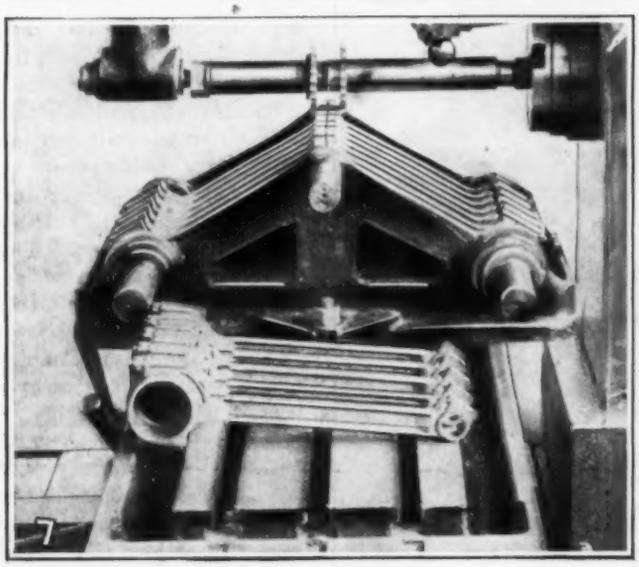
AUTOMOTIVE PRODUCTION











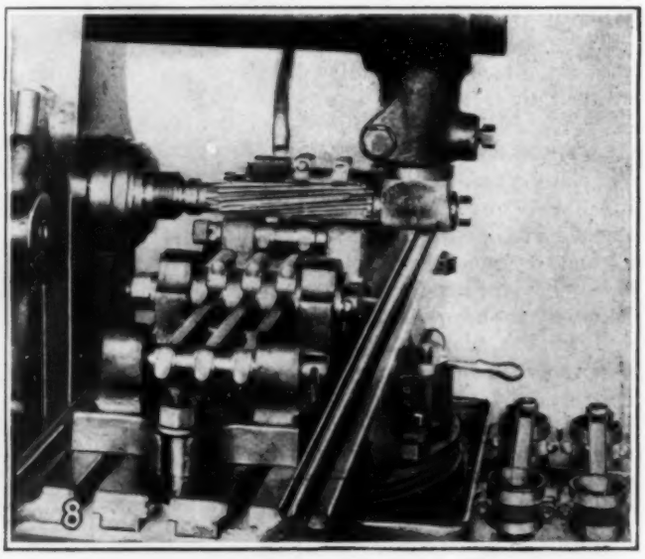
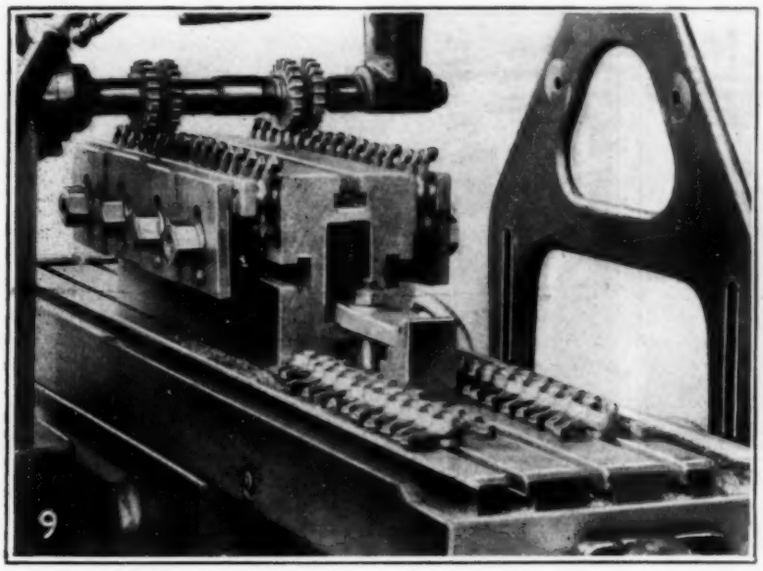


Fig. 3—Facing the connecting-rod ends. Fig. 4—Milling the shanks. Fig. 5—Facing the crank end to fit the cap. Fig. 6—Undercutting the shanks. Fig. 7—Facing and splitting the piston-end lugs. Fig. 8—Finishing the shanks

AUTOMOTIVE PRODUCTION



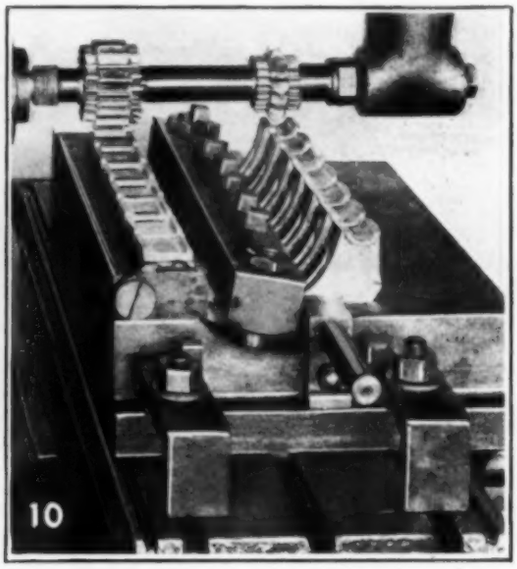


Fig. 9—A multiple set-up of valve rocker arms. *Fig. 10—Form milling aluminum brake shoes*

on the length of the jigs, a number of which could have been made considerably longer, so far as available travel of the work tables was concerned. Excessive overhang of the table in its ways would have resulted, however, and the fact that inaccuracies might have resulted was given due consideration.

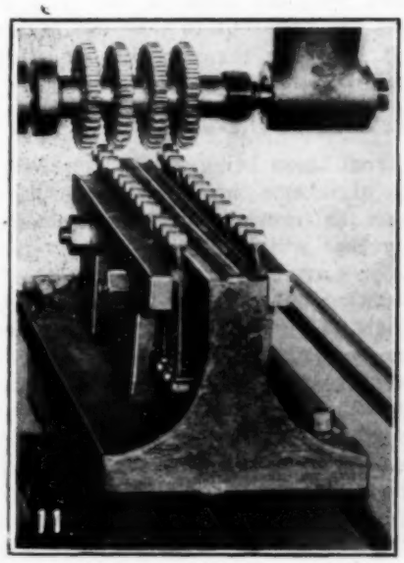
An interesting set-up on a La Blond milling machine to cut the teeth in steering wormwheels is illustrated in Fig. 1. The gear is mounted on an arbor between vertical centers in a jig that is secured to the milling machine table, and is rotated at the proper rate by means of a dog on the lower squared end of the arbor, which in turn is driven by a pin projecting from a face plate on the lower live jig center.

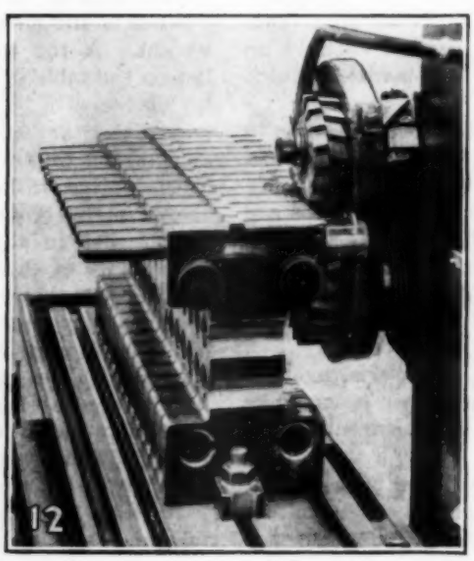
The shaft which drives this center runs in a long bearing in the jig parallel to the machine spindle and gets its rotation from a gear assembly mounted on the face of the column and meshing with a gear on the machine spindle. Inside the body of the jig there is a worm on the shaft and a wormwheel on the jig center spindle that are duplicates of the wormwheel being cut and the cutter hob. The blank is thus driven correctly to eliminate any drag as the machine table crossfeed advances it on the cutter.

The upper dead center is released so it can be raised to change the work by turning the milled nut that shoulders over its end. A gage at the side determines the correctness of the blank location on the arbor.

In Fig. 2 is shown the set of go and no-go gages for controlling the quality of the part. This set and its mounting is typical of the inspection plan followed by the company for each of the small parts that enter into the final assembly, and is a good one.

A board is provided, neatly laid out to contain not





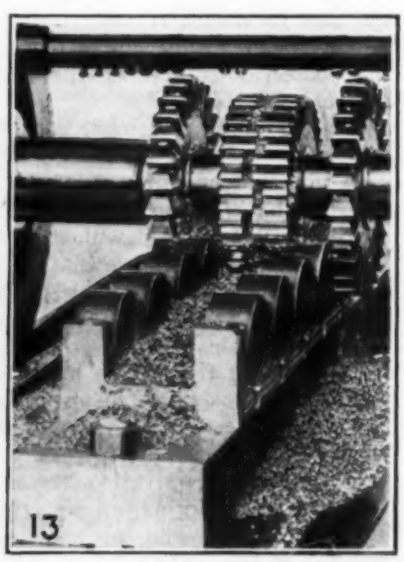
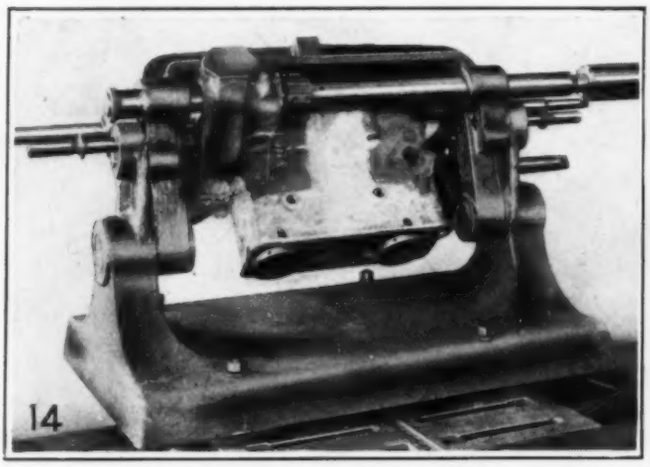


Fig. 11—An operation on friction clutch levers. *Fig. 12—Two cutters at work with a multiple jig.* *Fig. 13—Part of the universal joint*

AUTOMOTIVE PRODUCTION



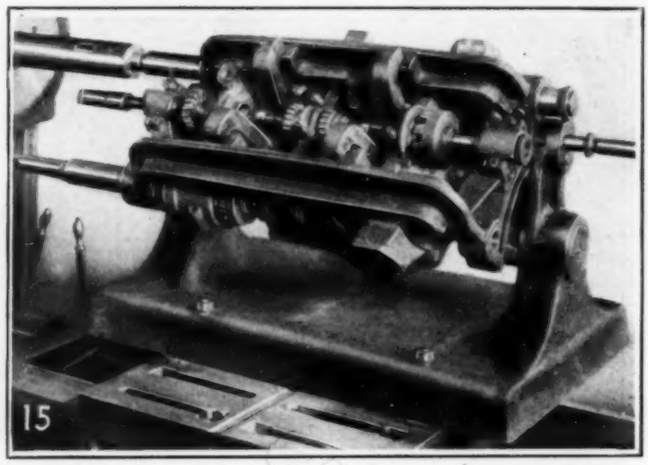


Fig. 14—Side view of the engine block in the boring jig. Fig. 15—Bottom view of the same block in the jig

only the gages, but also one of the pieces and such parts as the arbor on which it is machined. Each gage carries the part number and a plate containing the name of the part is secured to the board.

This arrangement serves to keep all the gages in order, to indicate any one immediately that might be missing, identifies the part and makes issue and return to storage a simple matter.

Six of the milling machine operations that are performed on the connecting rod with multiple settings are illustrated in Figs. 3 to 8, inclusive.

Operations on the Connecting Rods

The rough forgings are set, four at a time, for facing the connecting rod ends in a jig illustrated in Fig. 3. The jig is bolted to the table of a La Blond milling machine. The bosses on these forgings are taken as the reference point and the jig is constructed so the rods can be set accordingly. The piston end fits into recesses shaped to allow the end to slide in, but to restrain it from rising after it is in place, and to allow for clearance under the lower rough face. The rod is held into this slot by means of setscrews against its other end. Spools register and confine the crank end entirely on the bosses, thus making the facing operation finish central with them.

One side only, of course, is milled in this setting to establish a working surface. The other is performed with this surface as the reference edge.

After the ends are faced on both sides, the rods are set in pairs in the jig illustrated in Fig. 4. Four cutters are arranged so that each takes one side of each rod and mills the shanks to the proper dimension. The completed surfaces at the ends are used for the reference points.

The table of the milling machine is lowered to place the work and is then fed up to the proper point when the vertical feed is taken off and the horizontal feed takes the rods past the cutters.

Following this operation, the crank-end caps are cut from the solid forging. A squaring cut is taken on the sides of the lugs and the piston end is bored out and finished in the other settings not shown. This makes the rod ready for the operation of end-milling the crank, as illustrated in Fig. 5, prior to fitting the caps in place.

The jig here shown is set up on a Cincinnati No. 2 vertical milling machine. The bore in the piston end boss, one face of this boss, one face of the crank-end boss and the squared sides of the crank-end lugs are used as reference.

A fitted pin at the bottom in each rod and a clamp at the top, against pairs of rods, hold them rigid while the cutter is at work. The jig itself is an excellent example of multiple pieces arranged to advantage. The table and feed are set to pass one row under the cutter and then move over to take the other row on the return stroke.

A cutter large enough to cover the entire width could be used to finish in one pass, or the set-up might also have been made in a horizontal machine, using cutters similar to those employed in the operation illustrated in Fig. 3. Following this end-milling operation, the caps are fitted, drilled and bolted into place, bored and turned.

The rods, again in pairs, are then set in the jig illustrated in Fig. 6, and with the sides of the ends as reference, the shanks are undercut to take out excess weight. A rod that has been through the operation lies on the table in front of the jig.

Three Rods at One Time

This rod differs from those being worked on, however, in that it has also been through the operation shown in Fig. 8, where the front and back of the shanks are finished in a jig that will hold three rods at one time. Two of these jigs are shown on the same table. One of them, however, has but two rods in place. It is possible with this pair of jigs to remove and replace the finished parts in one as the cutting is proceeding in the other. The reference for the setting in this case is the bored hole at each end of the rod. The table is lowered to pass the lugs on the jig and the crank-ends, fed up to the proper point, and then started longitudinally to take the cut.

In Fig. 7, a No. 3 Cincinnati is facing the piston-end lugs and splitting them at the same time. Twelve rods are set up in a compact arrangement that practically eliminates any lost cutting time. The set-up reference

AUTOMOTIVE PRODUCTION

is as before the bores at both ends of the connecting rod.

Another Cincinnati No. 3 is set up to mill the sides of valve rocker-arms, according to the illustration at Fig. 9. Thirty-four pieces, seventeen on a side, are held in the jig in groups. The line-up on pins through their previously finished centers squares them for the cut. They are secured by sectional clamps. When one end has been milled, they are again set in the same jig with the other end in position.

In Fig. 10 seven aluminum brake shoes are set under form cutters that finish the ends. They are positioned by two long pins that pass through holes previously jig drilled. One of these pins passes through a gaging block at the forward end of the jig. The other can be seen ending in the body of the first piece, to the left and under the center hold-down clamp.

Still another example similar to the set-up for the rocker arms is illustrated in Fig. 11, which shows twenty-four friction clutch levers ready to be worked on.

Brake cams are jigged for cutting the flats, as illustrated in Fig. 12, on the table of a Kempsmith milling machine. The jig itself is rather more elaborate and more completely finished than those illustrated so far. It is double-ended and finished so that it can be turned bottom up from the position shown and used for the same purpose. Slots cut through this jig and through the holes containing the work to rows of holes near the center make it possible to spring the sections by tightening on the two through-bolts whose heads are shown near the top in the end of the jig. This closes the slots and pinches the parts. The construction is a common one in milling cutters, but requires the work that is held to be very nearly a given size as the movement is not large enough to compensate for a great size variation.

A gear is added to the machine spindle, for this operation, to drive a second auxiliary spindle and cutter that makes it possible to machine both flats on the parts at the same time.

Yet another jig for multiple parts is illustrated in Fig. 13, where a part for the cardan fork, or universal joint as it is perhaps better known, is set up for facing on both ends.

Jig for the Engine-Block

Two views of the swinging jig used to bore and face out the crankshaft and other engine-block bearings are illustrated in Figs. 14 and 15. The first shows a side view with one of the cutter bars in position. The second is a bottom view showing the bars and cutters in place for all the operations.

The results obtained can well be taken as examples for other companies who have similar equipment and who face the same necessity of making fair profit with what they own, in order that they may create a fund from actual operations that will enable them to purchase and install the correct new machine.

While it is in many cases entirely out of the question for a given company to secure new equipment whenever its need arises, it lies within the ability of every manufacturer to make added profits with what he has that will create a basis for the constructive installation of the latest and best equipment as the Ansaldo engineers have so ably demonstrated.

Motor Shop Problems

"Two-tenths" tolerance on hobs— More about honing

By Frank C. Hudson

THE problem of quiet running gears in transmissions and timing mechanisms has led to a demand for tolerances in gear cutting that do not seem reasonable, or sensible, in many cases. Makers of hobs report specifications calling for leads that shall be accurate within "two-tenths." When we realize how small two-tenths really is and consider that in the hobbing machine there are anywhere from six to thirty gears, such a tolerance seems a bit absurd, to put it mildly.

The wisdom of such a close tolerance becomes even more questionable where the gear teeth are afterward ground in one of the modern machines built for that purpose. One alibi is that they want to grind an equal amount from each tooth and from each side of the tooth, in order to get perfect gears for quiet running. But in view of the inevitable change of shape in a gear during the heat-treating process, changes that must be removed by grinding, the demand for such a close tolerance can hardly be justified on that ground.

If the gear-cutting machines (or any others) were perfect, there would be more excuse for demanding a two-tenth tolerance on hobs. As it is, with the ease in which the gear-tooth grinder goes over the teeth twice, it would seem as though a greater tolerance could be used than before, with equally good results in the finished product.

Another factor that is too often overlooked in some shops demanding very close tolerances, is that few of them are in position to measure such small dimensions. Many shops without adequate measuring facilities talk about holding work to much closer limits than they can measure. This is frequently proved by makers of hobs and other tools when they are called on to replace tools rejected as outside the tolerances called for. Where close tolerances are really necessary, let us have them by all means. But we must not forget that it is a waste of time, money and effort, to work to a "tenth" when a thousandth or even two or three, will give just as satisfactory results.

Honing Again

I mentioned the other day the two schools of honing, if we may call them that. In one, a high rotative speed and a slow reciprocating motion is used, while in the other the opposite combination is advocated. Since then I've run across a third method, used by one of the well known companies, using high speed in both directions. Not the same, but about 150 r.p.m. and 100 strokes per min.—the only case I know of using this method.

There are two honing operations, one with about 80 grit and the next with the usual 150 or 180 grit. Kerosene is the lubricant and it is filtered after use before going back to the hones again. About a minute or a minute and a half finishes the job.

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Fixture to Center Square Stock

BY WILLIAM DENTON

In building the Noiseless typewriter there are many pieces of ⅛-in. square stock to be centered so that each piece may be held on the centers of a lathe to be turned. As the turned portion extends but a short distance from the ends and the turned diameter is about equal to the distance across the flats of the square it is very essential that the centering should be exact. The illustration shows a simple fixture applied to a speed lathe, that enables the operator to get out the work very rapidly without sacrifice of accuracy.

Centering square stock

The fixture consists mainly of a pair of uprights bolted to the shears of the lathe, and having at the upper end of each a block of hardened steel in which is a square groove of a size to admit the stock readily, but not to allow any appreciable shake sidewise. The positions of the blocks are such that when a piece of stock is laid in the grooves, it is in alignment with the center line of the lathe.

A bracket to hold the guide bushing for the center-drill is fastened to the upright nearest the headstock. The tailspindle of the lathe is moved by a hand lever. All the operator has to do is to lay a piece of stock in the grooves and hold it down tightly with his left hand while he advances it to the drill by means of the tailspindle. No mechanical means of fastening the stock in the grooves is necessary.

Machining Heavy Castings

BY JACK WILLIAMS

Some large stone-crushing machines that are worthy of note, not only by reason of the exceptional size and weight of the individual castings, but because of the methods employed to machine them, have recently been completed at the Farrel Foundry & Machine Co., Ansonia, Connecticut.

The main frames of the machines are in two parts, bolted together along a vertical joint at front and back. The entire frame was cast, however, in a single mold in which the halves were separated by cores but joined by fins or connecting bars. About 80 tons of metal were required to fill each mold, including gates and risers.

Nothwithstanding the unusual amount of metal to be poured in a single mold, the pouring was accomplished with no difficulty whatever. Two travelling and two jib cranes were employed to serve the metal from a battery of four cupolas and the pouring was continuous from both ends of the mold.

Before the castings were dug out of the mold, the shrinkage caused the connecting bars to break so that each frame could be handled thenceforward in two parts until the machining was completed. Since no single crane with which the shop is equipped could be trusted to handle the 40-ton castings with safety, an equalizer—consisting of a 30-ft. I-beam, 18 in. deep, was slung by the ends from two 30-ton cranes and the load suspended midway between them.

There are no planers in the shop big enough to compass the castings and they were therefore levelled up on floor plates beside the planer having the longest stroke, and the auxiliary head of the planer bolted to the platen—which proceeding makes "a planer big enough to take in a cathedral" as our old friend Chordal was wont to say.

The cross-planing to seat the bearing caps was done in a 6-ft. Morton draw-cut shaper with the castings on the floor plates, and the bearings were bored (separately) with the boring attachment on this machine without disturbing the set-up.

So accurately were the settings made for the various machining operations on the halves of each frame that when they were finally bolted together and the main shafts, were set into the bearings, no more scraping was needed than if the frames had been bored as units.

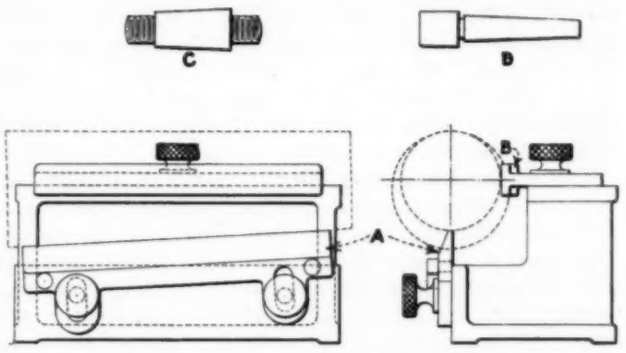
IDEAS FROM PRACTICAL MEN

Gage for Testing Taper Pins—Discussion

By R. Grant

The gage shown in an article under the title given above, by F. W. Ming, on page 665, Vol. 61, of the *American Machinist*, is unquestionably preferable to a ring gage both in the making and the using.

For several years, however, gages similar to that shown in the illustration have been used in the production of taper parts having very close degree of precision. Instead of the work lying in a V-block, it lies upon the straight-edge *A*, which is hardened, ground and lapped. Like the knife-edge of Mr. Ming's gage, this is beveled so as to leave a face of about ¼ in. It is adjustable as to angle and, having two buttons or pins accurately spaced from its edge, constitutes a sine bar and is set by use of Jo-blocks.



An accurate gage for tapered work

The adjustable backrest *B* may be set closely enough by means of a protractor, with the gage standing on end on a surface plate. Its function is to cause the work to lie central on the straight-edge and it is always set to one half the included angle. If but a few pieces are to be measured, the readings along the top surface of the work, as it lies in the gage, are made on a surface plate using an indicator. A master plug used in connection with the gage is a convenience.

Our practice with such a gage, when used for quantity production, is to provide a quick-acting spring clamp that holds the work in gaging position when swung into place. Then a piece of angle plate for a track is fastened to platform of an Ames gage so that the taper gage with work may be moved back and forth under the indicator. Adjustable end-stops are provided to limit the travel of the gage.

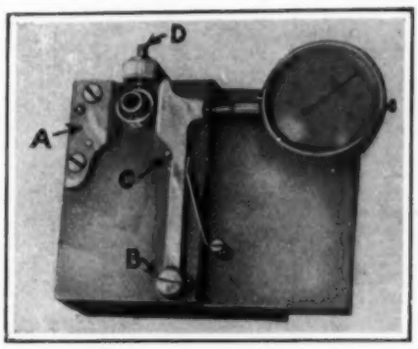
Much of our work must fit a taper hole, so that a shoulder at the large end of the external piece shall be accurately located with reference to the faced end of the taper hole. In other words the diameter of the tapered external part is as important as the degree of taper. Here again an accurately made master plug is needed. In the case of a job like *C*, an end stop is used to locate against, while one like *D* is positioned against the end of the lower straight-edge, thus enabling both diameter and degree of taper to be checked simultaneously.

As a further convenience we put a small hardened post in the top of the gage and grind it to such a height as will exactly match the height of the upper side of the master plug when lying in the gage. In a general-use gage, the post should be adjustable. By this means, a quick check-up for diameter of work is possible at any time without using the master. Where the gage is in constant use on one particular piece of work, the straight-edge should be provided with an adjusting screw under each end, and the screws should be sealed with wax after the gage is set.

Gaging Ball Bearings

By Chester H. Franklin

A somewhat unusual application of the dial indicator is shown herewith. The gage is for inspecting the outside diameter of ball bearings on the brush of the Hoover vacuum cleaner and is used in the plant at North Canton, O. A base plate carries the fixed knife-edge *A*, the swinging blade pivoted at *B*, and the dial gage. The stop pin *C* prevents the blade from swinging too far to the left. A stop screw *D* forms a back stop for the bearing. The bearing is slid along the base plate and between the two knife edges, being kept in contact by the flat spring shown behind the blade. The dial indicator shows the comparative size of the bearing cage.



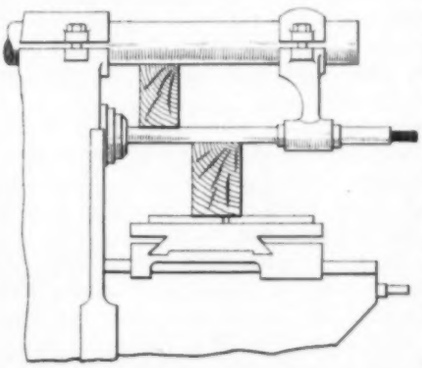
Dial gage for ball bearings

Straightening a Milling-Machine Arbor

By Charles Kugler

The method of straightening the arbor of a milling machine as shown in the sketch herewith is far superior to that usually employed—taking it to a lathe and using a bar on it.

The method is so obvious from the sketch as hardly to need explanation. The kink or bend is located by means of an indicator, set at its low point. A block of wood wedged between the overarm and the arbor behind the kink and another one placed on the table of the machine. Pressure is applied by the elevating screw of the knee. The outboard support can easily be placed in any position along the arbor, or, sometimes two blocks of wood can be used above the arbor to advantage in straightening out kinks that are either short or refractory.



Straightening a milling-machine arbor in place

IDEAS FROM PRACTICAL MEN

Three Devices for the Planer

BY CARROLL S. ASHLEY

Two views of an adjustable planer stop are shown in Fig. 1, the function of which is to shorten or lengthen the stroke or travel of the platen without changing the position of the stop itself. It will readily be seen that, when machining material with angular ends or when cutting into a recess or angular opening, the stroke can be changed by small increments without shutting down the planer to shift the stop, and shifting the stop while the machine is in motion is oftentimes detrimental to the work.

As an example I will cite the operation of blocking out and dove-tailing an under reamer (a tool used on the "standard rig" in oil well drilling). The work has to

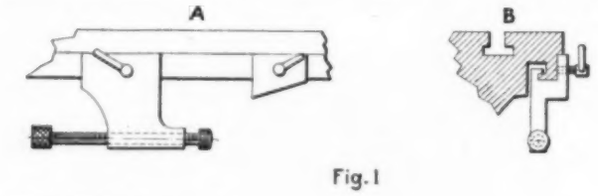


Fig. 1

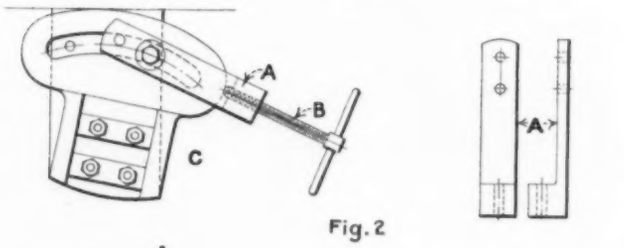


Fig. 2

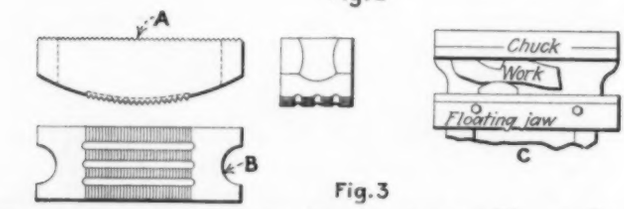


Fig. 3

Fig. 1—An adjustable stop for the planer. Fig. 2—Device for planing a radius. Fig. 3—Clamping block for a planer chuck

be drilled for clearance and the webbing chipped, so the planer tool will have an opening into which to push the chips—and that opening is 15 deg. from the vertical. Since the stroke must be lengthening as each cut is taken it will plainly be seen what a tremendous advantage the operator has if the planer is equipped with such an adjustable stop. Sometimes a hard spot will be encountered, or the chips will bunch up and the stroke will have to be changed.

Generally, the operator has a worn out brush in his left hand, to hold over the tool at the end of the cutting stroke to keep the chips from flying into his eyes, and a chip flipper in his right hand, while his right foot is always resting on the shifting rod, ready to reverse the planer if the tool sticks. Under such conditions, you can bet a few kopeks that he would never make any bonus if he had to stop the planer and shift the stop by guess. So far as I an concerned I would not run a planer without it being so equipped, and I have operated a planer for over twenty years. The side elevation *A* and the section of the platen at *B* illustrate the idea. The screw is long enough to change the travel of the platen five inches.

The problem of machining circular work on a planer is taken care of in different ways in different shops. Unless there is a lot of work along this line, very few shops make any pretense of installing circle-planing attachments. The common practice is to set the tool the required radius and tighten the clapperbox quadrant or the "harp," whichever one is to be swung, just tight enough so that it can be moved by a light tap with a lead hammer. One time I had a job to plane, having a 15-in. radius. Of course, I set the point of the tool 15 in. from the center of the harp, and I loosened and tightened the harp at the end of every cutting stroke of the planer—some job!

The device I am describing is just a makeshift, yet it is much better than using a lead hammer. In Fig. 2 are shown the two members that constitute the device. The piece A is held in position by the retaining stud that ordinarily hold the clapperbox quadrant to the vertical slide, the other stud being removed entirely. In operation the tool is set the required radius from the center of the screw on which the quadrant swings, and the beforementioned stud is tightened to the proper tension, which is determined according to the depth of cut and the kind of material used.

The end of the screw *B* bears against the quadrant as shown. The handles of the screw should project at least 2½ in. on each side of the head to make it easier to turn. At each stroke the screw is turned, thus moving the quadrant. If the conditions are such that the stud must be drawn so tight as to prevent operation of the screw, such as too heavy a cut, or trying to cut too large a circle, it will be found very easy to loosen the stud at the end of the reverse stroke, operating the screw immediately and then retightening it. By moving the reverse stop on the platen for a longer stroke, the elapsed time between the instant the platen stops and the tool re-engages in the work, gives plenty of time for this manipulation.

Two views of the device are shown without the screw. I have drawn it with two holes to receive the stud of the clapperbox quadrant, but that is optional with the user, and it may be necessary to have more to suit different planers.

A clamping block, to be used in holding odd shaped pieces of work in the chuck, is shown in Fig. 3. Planer-hands will find that this block will hold the work very securely and will not slip under exceptionally heavy cuts. The block should be made of a good grade of machine steel and case-hardened to a depth of $\frac{1}{16}$ in. The block I am now using, and which I designed several years ago, is 3½ in. long, 1¾ in. wide and 1½ in. thick.

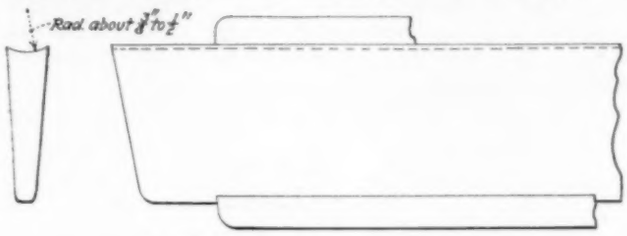
The surface *A* has very fine teeth, such as can be made on any planer by using a one notch feed, and on the rounded surface are coarse teeth with grooves cut crosswise to enable the teeth to grip or bite into the work. On the ends at *B* are grooves that enable the operator to hold the block in position with his thumb and finger while he tightens the floating jaw of the chuck against the work. A piece of work clamped in the chuck is shown at *C*.

IDEAS FROM PRACTICAL MEN

Cutting-Off Tool Ground to Prevent Binding

By H. J. Gustav Kopsch

When cutting off round stock 2 in. or larger in diameter, especially if the stock be high-speed steel, I have found that the tool cuts much more freely if the blade is ground slightly hollow on top, and that little difficulty is experienced from the tool sticking, or binding, in the kerf. I usually grind the blades of high-speed cutting-off tools with a shallow groove running the whole length, as indicated by the appended sketch.

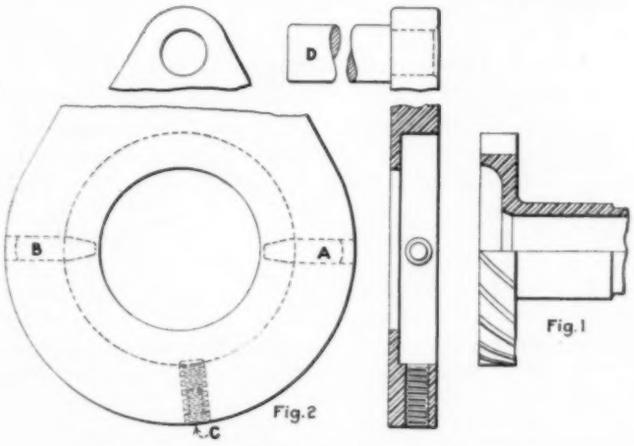


Cutting-off tool ground hollow

Work Drivers for the Grinding Machine —Discussion

By Alfred T. Gregory

After reading the article by H. J. Gustav Kopsch, under the title given above, on page 27, Vol. 62, of the *American Machinist*, I was reminded of a special dog evolved for driving the helical gear shown in Fig. 1. An ordinary lathe or clamp dog would be either impossible or impracticable for production purposes in connection with this gear, so the dog shown in Fig. 2 was made. The two projecting pins *A* and *B* mesh in with the teeth on the gear. Since it is a right-hand gear with teeth at an angle of 45 deg. the tendency when in use is for the gear to "bite" into the dog.



Figs. 1 and 2—The work and the driver

The flat-pointed setscrew *C* is used to tighten the dog in place and is so located that it bears on the top of one of the teeth. It should be noted that the depth of the counterbore is slightly less than the width of the gear, so as to allow clearance for the lathe tool and grinding wheel. This particular dog was used on the lathe for turning, but a similar one without the tail *D* was used on the grinder.

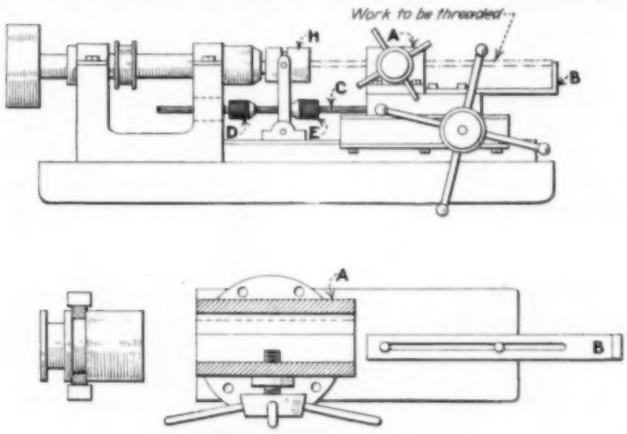
Utilizing an Old Screw Machine

By W. N. Brown

Being a consistent reader of *American Machinist*, I have taken considerable interest in the Ideas From Practical Men section. So I feel that I should try to do my share in that department along with some of the others who have sent in some remarkable ideas.

Possibly my article will be poor enough to start a discussion, which is usually more accurate than the original article.

Our firm recently replaced a small worn-out screw machine with a more modern one. With a few changes and the expenditure of a few dollars, we made over the old machine into a very efficient one for drilling, threading and tapping.



The salvaged machine

It will be seen from the drawing that the vise *A* is a U-shaped casting having a circular base to fit the turret seat. The vise is provided with a screw and a shallow V-block for holding round work.

The stop *B* is slotted for adjustment, and is much better than the swinging stop in front, as used on the ordinary threading machine.

The adjusting screw *C*, with nuts *D* and *E*, controls the opening and closing of the rotary, self-opening die head *H*. A hole drilled through the headstock allows the screw *C* to pass through it.

The spindle was bored out and a quick-change, drill-chuck collet pressed into the end. This gave a hard spindle nose with a No. 3 Morse taper, making the machine adaptable to hold any kind of a taper-shank tool.

We also removed the drive and pump pulleys from the countershaft and mounted them directly on the spindle. A 1-hp. motor was mounted on the leg of the machine and belted directly to the spindle. The pump was also belted to the spindle, making a very compact machine.

We have given this machine about three-months' service on regular production and it has shown wonderful results in doing most anything on the end of a shaft, whether it be drilling, tapping, threading, chamfering or counterboring.

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Drilling and Countersinking Glass

Q. How can I drill and countersink glass panels?

A. Lay the glass on a flat surface with three or four thicknesses of soft paper between. Use a copper tube of the right diameter, instead of a drill. Feed fine abrasive and light machine oil between the end of the tube and the glass. Revolve the tube at high speed and use very light pressure. When the glass is drilled half-way through, turn it over and complete the drilling from the other side.

For countersinking, make a countersink of copper and proceed the same as in drilling.

Making Press Fits

Q. Can you give me a formula for figuring allowances for press fits?

A. A formula for finding the pressure, in tons, required for forcing together mating parts having various allowances, is:

$$P = \frac{A \times a \times F}{2}$$

A formula for the allowances required to force mating parts together at certain pressures, in tons, is:

$$A = \frac{2P}{AF}$$

In both formulas, A is the area of contact of the parts, in square inches. a is the total allowances of size, in inches. P is the pressure, in tons, required to force the parts together. F is the pressure factor given in the accompanying table.

Diameter of Work, In.	Pressure Factor	Diameter of Work, In.	Pressure Factor
1	500	5	91
1¼	325	6	75
2	240	7	64
2¼	189	8	55
3	156	9	48.7
3¼	132	10	43.5
4	115	11	39.3
4¼	101	12	35.9

Drawing Sheet Metal

Q. I read an article regarding the drawing of aluminum shells, in which it was stated in each operation after the first, the shell was reversed in the dies and turned inside out.

What is the reason for turning the shell inside out in each operation after the first?

A. In drawing by the older methods, the successive operations when made in the same direction, thinned the metal somewhat and drew out a certain amount of metal from the blank holder. The operations were combinations of drawing and ironing out and the thinned metal at the corners of the drawing ring had to stand all the strain.

In the process to which you refer, all the metal to be used in the shell is put into the depression in the first operation, in which it is drawn to the same thickness as in the finished shell.

By alternately reversing the piece in the successive stages, each operation becomes one more of folding than drawing, does not draw appreciably upon the metal held in the blank holder and does not further thin the metal. You will readily see that in turning the work inside out, the metal will naturally hug the punch, so that the piece will be deepened and made the proper diameter without the occurrence of drawing effect.

Making Gears

Q. We have a lot of gears of the following dimensions to make: Pitch, 10. Number of teeth, 14. Width of face, 1¼ in. Hole, taper, 0.10 in. per in.; ⅝ in. at small end and 1.6 in. at large end.

We are putting straight holes in the gears and stringing eleven of them at a time on an arbor and cutting the teeth. The taper hole is finished last. Is there any better way of doing the work?

A. By finishing the taper hole after the teeth have been cut, you will not get a good job unless you have some device for holding the gears, more accurate than the ordinary lathe chuck.

We should advise you to finish the taper holes first and then do the turning, facing and cutting the teeth while the blanks are mounted on a taper mandrel. While, by this method, you will be able to cut the teeth in but one gear at a time, you will have less loss on account of gears not running true.

Cementing Glass to Metal

Q. Can you tell me of a cement or putty that will hold glass to sheet copper? I want to apply small squares of glass to a copper bowl so they will hold firmly. I have tried litharge and glycerine, but with poor success?

A. We believe some one of the celluloid cements on the market will meet your requirements. They are practically liquid celluloid and can be bought under various trade names at hardware stores. They are inflammable and should not be used near an open flame.

Probably the next best cement for your purpose is a good grade of shellac varnish.

Formulas for Keyseats

Q. Where can I get copies of the keyseat formulas compiled by the American Society of Engineers?

A. Your question is not intelligible, since we know of no such society as the American Society of Engineers.

The American Society of Mechanical Engineers has its headquarters at 29 West 39th St., New York City, but we do not believe it publishes a keyseat formula. It may be that such a formula has been published by the Society of Automotive Engineers. Its address is also 29 West 39th St., New York City. Address the Secretary.

Technical Abstracts

The Action of Cutting Tools

The British Institute of Mechanical Engineers has had two papers contributed, one by Prof. E. G. Coker, and the second by Dempster Smith and Arthur Leigh. These papers are given completely in this article, containing many illustrations showing the principles involved. Prof. Coker's paper deals primarily with the cutting action taking place in milling and in milling machines, as revealed by his photo-elastic method. A machine was devised whereby the cutting action of a milling cutter could be examined on the edge of a transparent plate of nitro-cellulose or other material and an inspection of the stresses generated, made by means of the color bands, revealed when a polarized beam of light was passed transversely through the "work."

One of the phenomena observed was, that after the cut had been taken and the tool run back, the point of the tool sometimes failed to make contact with the work. In a new 8-in. center lathe, with rigid tool support, it was found that a tool with a cutting angle of 45 deg. and a clearance angle of 3 deg., when set to a feed of 0.015 in., produced a gap of 0.003 in. in cutting steel. Microscopic observation shows that the tool pulled up the material locally, so bulges were developed under the tool point. This distortion diminished regularly in the vertical direction, and tended to vanish at some depth below the cut surface. It is suggested that this tearing action produces roughness on the surface of the cut. Prof. Coker recommends further experimental research, using a steel tool on the machine with nitro-cellulose or bakelite work pieces.

The second paper deals with the life of lathe tools. On light cuts, E. G. Herbert shows durability, as the speed is increased, rises to a maximum first falling, then increasing to a second maximum and finally decreasing without further interruption. The results are given and curves are shown of the various maxima and minima. On light cuts, the curves show two maxima for durability, namely 40 ft. and 155 ft. per minute. This point would seem to vary with different tool steels and material.

One conclusion that is drawn is that carbon steel at low speed has on the average a durability as good as high-speed steel, from which fact it is suggested that it would be just as satisfactory and more economical to employ carbon instead of high-speed steels for files, hand reamers, taps, etc., used for light cuts at low speeds. Another interesting point brought out is that durability is not increased by the use of a lubricant. Contrary to common belief, the durability with a cutting compound did not reach the value of the durability when the tool was run dry.—*The Engineer* (England), March 20, p. 318.

Selling New Types of Machine Tools

George M. Meyncke gives some diagrammatic methods of explaining the improved functions of machine tools so as to produce a better sales reaction. Presenting data by curves is one means of picturing information that would otherwise require a lengthy and involved description. The engineering type of mind can grasp this but too often the shop executive type prefers to have something more concrete and so diagrams such as are shown in this article appeal to him.

One example is given, showing the amount of collant required on a particular machine. This is vizualized by liquid measures, varying in size from a very small one to a very large one and a pipe line that is flowing the coolant on the cutter is correspondingly increased. Another diagram shows graphically the difference between continuous and station milling.

The author goes on to state that the preliminary work of introducing a new machine tool is educational in character. The machine tool salesman is an instructor and every teacher knows that for effectiveness he must be equipped with several ways of saying the same thing. The first explanation leaves an impression, the second instills a general idea, and it frequently requires a third and fourth in order that the full force of the idea be firmly impressed.—*Machinery*, March, p. 527.

What Is a "Skilled" Man?

Merrill R. Lott, personnel superintendent, the Sperry Gyroscope Co., discusses the loose way in which trade names are handled, pointing out that serious results arise due to the fact that in published statistics it is difficult to know exactly what type of mechanic is being described. Toolmakers for example, have a wage scale in New York ranging from $0.47 to $1.05 an hour. That a toolmaker is receiving the lowest rate, does not indicate he is getting bad treatment, but means that he is being paid in proportion to his skill. The term toolmaker is used in too broad a sense and covers too wide a range.

It is shown how different operations should be classified. To illustrate his point he takes a milling machine operator. There arose immediately the question whether this man was the same as a milling machine hand, a milling machine specialist or a machinist. It was found that the term was applied to any person working on a milling machine, on any type of work.

Mr. Lott states that such an operator should have the experience of at least one year's work on a milling machine, or the equivalent on some sort of a machine-shop tool, that he should have an education or a working knowledge of common fractions and decimals, and that he should be able to read blue prints and instructions. Under the classification of knowledge, he should have the ability to distinguish ordinary metals, and have a sufficient knowledge of the physical properties. He should have ability to drill to within 0.008 in., and also able to mill straight flat work or parallel bars to 0.005 in. of true size. He should also know how to set up plain vise- or fixture work and how to use such hand tools as the center punch, cold chisels, files, lead hammers and wrenches, as well as various measuring instruments.—*Industrial Management*, March, p. 179.

American Machinist

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KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

What's Wrong with the Railroad Shops?

NEARLY three years ago the outlaw shopmen's strike drew the attention of railroad executives with unpleasant force to the fact that their repair shops could not be ignored. Now, the equally unpleasant imminence of going into court to settle the question of whose method of valuating repair shop equipment is the right one brings the subject up again.

In another column an official of the National Machine Tool Builders' Association intimates that the railroad managers have shown very little enlightenment or progress, so far as their shops are concerned, even during the last two years when some of the roads have been making good earnings. He admits exceptions but only to the extent of proving the rule.

We are inclined to believe that the valuation proceedings are going to bring out some unpalatable facts to prove that railroad repair shops have been consistently starved and tolerated only as necessarry evils in connection with the railroad business. The technical problem of arriving at a fair way of valuating equipment that still has some usefulness to its present owners but would be almost if not quite worthless in a forced sale is no small one. Here's hoping that it can be solved to the satisfaction of all concerned.

From the railroad standpoint it is going to be very difficult to show much value in machine tools that date back to the last generation, most of them obsolete, many of them worn out.

Happy will be the railroad management, and especially its cost engineers, that can point to a shop full of modern, well-maintained machinery and equipment, when its day in court comes round. Not only will its valuation figures show up well but they will be easy to substantiate.

Honesty in Selling Used Machinery

WHEN we are deeply interested in a subject we are apt not to see all the various phases it presents. Such a case is presented by the second-hand or used machine situation.

One of our great problems, as pointed out so ably by Secretary Hoover, is the elimination of economic waste. And it is certainly a waste not to use machines as long as they give an economic return. The great trouble is that some of them are used far beyond the economic period.

The greatest difficulty in connection with second-hand machinery is that it is not always what it seems. The buyer is apt to let the apparent saving blind him to defects that greatly affect the output. Then, too, sellers of second-hand machinery have been known to refrain from pointing out defects even if they did not actually misrepresent. Some are even accused of altering the serial numbers on a machine to make it appear of later vintage than it really is.

When a buyer gambles with his production cost to the extent of buying a machine "as is," he wants to be very sure he is getting what he thinks he is. If he depends on the seller's statement of condition he has a good case for fraud if it is not as represented. The statement should be in writing.

We believe there is a legitimate place for used machinery in good condition, but we are opposed to any misleading statements as to its condition.

Commercial Aviation Arrives

COMMERCIAL aviation is an established fact in the United States. With the first round trip of an all-metal monoplane carrying a useful load of half a ton between two plants of the Ford Motor Co., an important milestone in the progress of aeronautics is reached. Perhaps Mr. Ford's latest transportation should be looked upon as an experiment, but if so he at least has plenty of resources to make it a successful one. Knowing what we do about the details of the experiment, we are inclined to believe not only that it will be successful, but that it is just the very small beginning of a very big progressive movement.

At the same time, we read of the steps to be taken within the next few weeks to establish new air mail routes. Evidently the terms of the Kelly bill which authorized the contracting of air mail service to private corporations are to be taken advantage of to the limit.

Much remains to be done in the establishment of landing fields and aerial lighthouses and in the enactment of vitally necessary regulatory legislation. Let us hope that the very real evidences of the start of a new transportation system will stimulate Congress to action.

For years the editorial page of the "American Machinist" has carried, from time to time, editorials expressing a faith that aerial transportation would be a reality. There were times when our voice seemed to be crying in the wilderness, but now we are beginning to gain confidence as a result of the rapid developments of the last few months. We expect to continue to boost for commercial aviation and we believe our faith will be justified.

Shop Equipment News

Arter Automatic Tappet-Grinding Machine

The Arter Grinding Machine Co., Worcester, Mass., has brought out a grinding machine intended primarily for the purpose of grinding the faces of valve tappets square with their stems, but which, by changing the holding collets, may easily be adapted to squaring the ends of hardened bushings and similar parts. It is an adaption of the automatic cylindrical grinding machine described on page 709, Vol. 61, of the *American Machinist;* the wheel head being of the same construction and having the same movements.

The work head is mounted upon a slide which has a movement upon the base parallel to the axis of the wheel spindle. The work-pieces are held by draw-back spring collets in four duplicate spindles which take their bearings in a cylindrical cage that is mounted upon trunnions so that it may be rotated. The rotation is intermittent and is actuated by a modification of the Geneva stop-motion. The four spindles provide loading, locating, grinding and ejecting stations, respectively.

By this arrangement the work spindles are disposed at right angles to the wheel spindle and the work is presented squarely to the face of the wheel. The slide upon which the work head is mounted is cam-actuated in synchronism with the movements of the wheel head. The timing is such that the work is pushed across the face of the wheel while at the same time the wheel is advancing at right angles to meet it. This advance of the wheel may be likened to the feeding of a standard forming, or "set," wheel, and means are provided to regulate it in accordance with the requirements of the work.

In Fig. 1 the spindle *A* is in the loading position with the collet open; the rotary head being at the moment stationary. As the Geneva motion comes into action the work head, carrying the four spindles, is rotated through 90 deg.; during which movement the piece of work that the operator has just set into the collet passes back of the fixed gaging block *B* and is located endwise between it and a spring plunger within the spindle. As the work reaches its proper position the draw-back collet closes automatically.

Upon the next cycle movement the spindle under consideration passes to the grinding position, diametrically opposite to the loading position, where its pulley comes into contact with the constantly moving belt *C*, Fig. 2, and is set by it into rotative motion. At the same instant the operating cam within the base of the machine advances the slide to pass the work across the face of the wheel and brings the wheel forward to meet it. In passing the third or lowest position, the draw-back collet opens and the work is ejected from the spindle. After completing three cycles, to fill the spindles, a finished piece of work is ejected at each movement.

All of the cycle movements of the machine derive their motion from a single camshaft located within the base and driven by a belt passing over a pair of four-step cones to provide a corresponding number of changes of cycle speed to the intermittently moving parts. The drive is through a friction clutch by means of which the operator may start and stop the cycle movement at will.

The rotative speed of the work spindles, driven by frictional contact with the belt *C*, is also susceptible to four independent changes. The universal-jointed shaft *D*, Fig. 2, transmits power through spiral and worm gearing to the Geneva movement that indexes the work head. The universal joints allow the slide to move back and fourth without interfering with the rotary movement.

The 16x2-in. abrasive wheel is

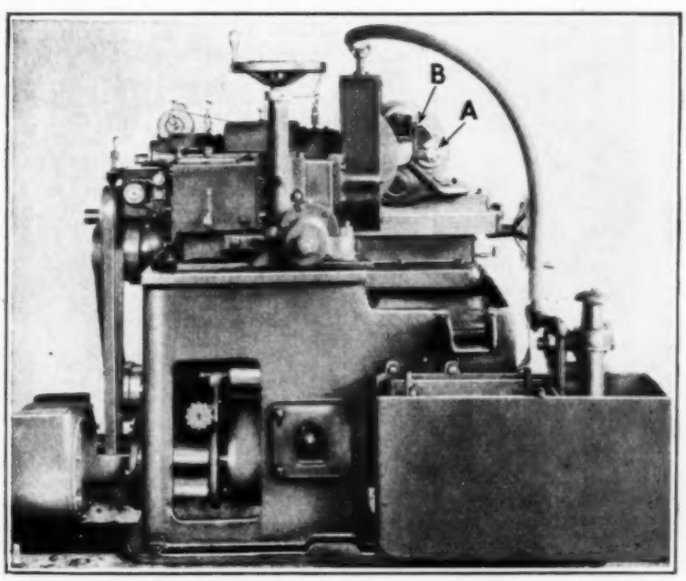


Fig. 1—Arter Automatic Tappet-Grinding Machine.

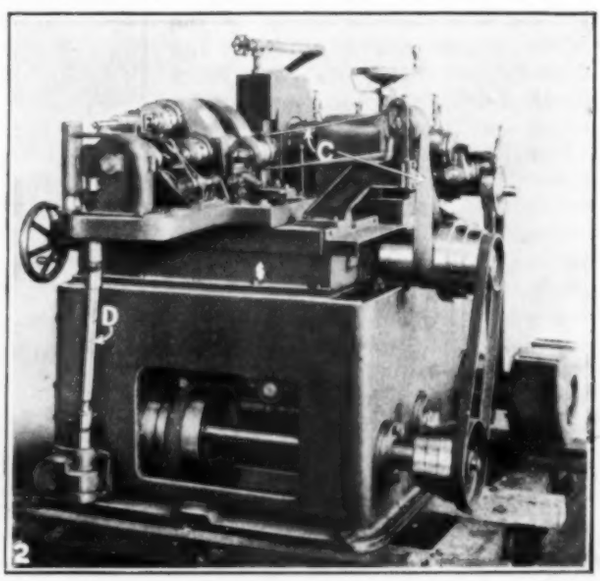


Fig. 2—Showing the mechanism of the work head

SHOP EQUIPMENT NEWS

driven by a 5-in. belt from the first shaft of the machine, also located within the base, and runs continuously. The wheel spindle runs in split, tapered sleeve bearings of bronze, adjustable to compensate for wear. Sight-feed oilers supply lubricant to the main bearings and these oilers are kept full by a small pump that draws oil from a reservoir in the main casting of the wheel head.

The wheel head is adjustable to any angle up to 20 deg. to grind conical as well as flat heads if desired. A secondary slide upon the wheel head, actuated by a screw with a micrometer-graduated dial, allows the wheel to be adjusted to compensate for wear without disturbing the setting of the automatic reciprocating movements.

The automatic movement of the wheel head is what is called "permitted" movement; meaning that the advance toward the work is brought about by means of constant spring pressure and regulated by the slow recession of the cam lever. At the instant of sizing the work the slide comes to rest against a stop under the pressure of the spring, and for the moment the cam lever is out of contact with it. The positive movement of the cam pushes the wheel away from the work.

The same principle is applied to the movement of the work-carrying slide, in that the working movement is by spring pressure and the positive action of the cam serves to bring the slide back. By this means any possibility of jamming is forestalled.

To distribute the wear of the wheel evenly and to prevent the formation of ridges or grooves in its face, the wheel spindle is given a slight oscillating movement endwise of the spindle. The amplitude of this movement is but about ¼ in. and is constant, but it may be put out of action at the will of the operator by moving a small lever.

The dimensions of the machine on the floor are about 4 x 6 ft. and the net weight is approximately 12,000 lbs. It may be driven by belt from an overhead line in which case the adjustable guards shown in the illustrations are provided, or it may receive its power directly from a motor mounted upon a bracket attached to the base. In the latter case a 15-hp. motor is recommended as the driving medium.

Barrett Governor-Controlled, Gear-Inclosed Portable Elevator

The Barrett - Cravens Co., 1328 West Monroe St., Chicago, Ill., is building a portable elevator in addition to its other lines of material-handling equipment which embodies a number of features for safety and ease in operation. The machine is built in a number of styles besides the one illustrated in Fig. 1 to suit varying conditions, but the lift mechanism is common to them all. The lift may be either hand- or hand and motor-operated, the motor when specified being set to chain drive without interference with the provision for hand operation. The motor functions only in the upward direction as the lowering of the platform is accomplished through the governor and the automobile-type brake wheel, which is built as a part of the safety governor.

This governor and brake - wheel unit is illustrated in Fig. 2. It is mounted on the upper shaft of the mechanism and engages the shaft through a pair of pawls and a ratchet wheel to resist rotation for a downward motion of the lift platform. It is held stationary by the load brake which rides on the brake wheel *C* until released by applying the elevating crank to a squared brake shaft extending back for the purpose to a convenient position for the operator.

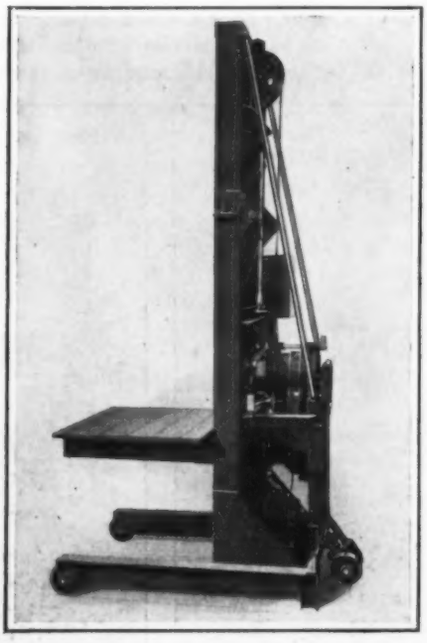


Fig. 1—Barrett Governor-Controlled, Gear-Inclosed, Portable Elevator

As the band is released by pressing to the right on the elevating handle, which must be removed from the starting shaft to operate the brake shaft, the brake-wheel unit is revolved by the downcoming platform against the pawls and ratchets. This motion causes the pivoted

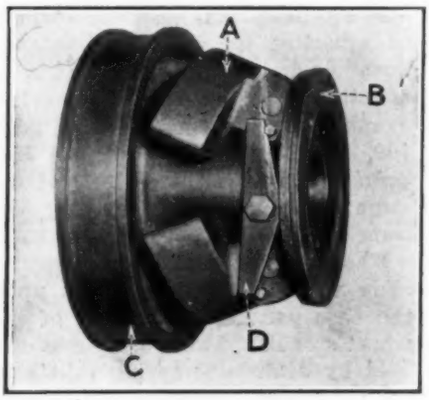


Fig. 2—The Governor Unit

weight arms *A* to move outwards by centrifugal force and press the Raybestos-faced, governor brake *B* against the stationary face of the machine housing. An equalizer *D* regulates the action of the two weights so they will act together.

The platform will descend against the action of the governor brake so long as the load brake is held away from the brake wheel. When it is released, the brake will at once stop any further movement. When the motor is included, its control is attached to this brake shaft so that holding the lever to the left will throw in a switch and cause the motor to raise the load, while releasing it will cut off the current, set the holding brake band and stop further movement of the platform.

Two lift shafts having squared ends extend from the housing so the platform may be lifted slowly or rapidly with a corresponding increase or decrease in available leverage. The gears are of steel with cut teeth. The pinions are case hardened and run in oil in the gear case which completely incloses all gears.

The company is prepared to furnish proposals when it receives information on dimensions of the material and storage building data.

SHOP EQUIPMENT NEWS

Monarch Helical-Geared, Ball-Bearing Lathe

A 4-speed manufacturing lathe has been designed by the Monarch Machine Tool Co., Sidney, Ohio, and is being built in four sizes, a 16-in. heavy-duty, an 18-in. standard, an 18-in. extra heavy-duty illustrated in Fig. 1, and a 20-in. standard.

The headstock, Fig. 2, is built for interchangeable applications to all four sizes and contains all-helical gears which are made from chrome-nickel steel forgings and heat treated. The end thrusts from these gears and

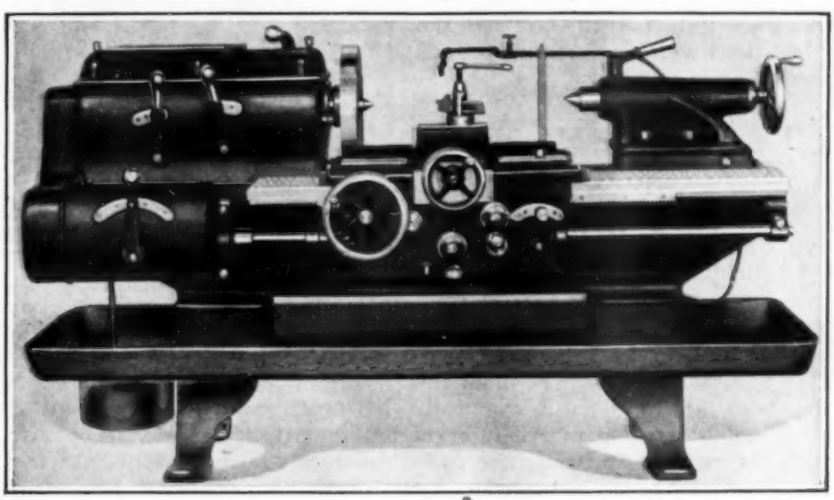


Fig. 1—Monarch Helical-Geared, Ball-Bearing Lathe

from the spindle are taken up by ball-thrust bearings, while the intermediate shafts and the driving pulley are mounted on heavy double-row ball bearings. The gears and shafts run in oil. Four spindle speeds are available by manipulating two levers on the front of the headstock which control two double-jaw clutches, one each on the spindles and the intermediate shaft. All of the headstock parts are readily accessible through a removable cover plate.

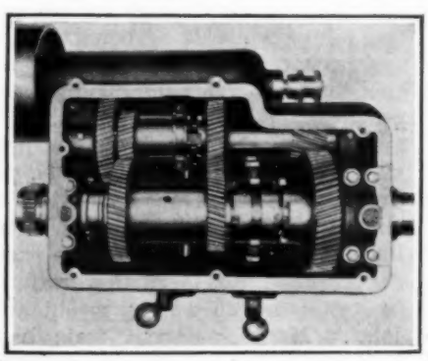


Fig. 2—The headstock opened to show arrangement and design

The feed box containing quick-change, hardened-steel gears is mounted just below the headstock and provides lever-controlled combinations of four feed changes that give 0.0125, 0.0192, 0.0372 and 0.0578 in. per revolution of the spindle.

The apron is cast in a single-piece, box section and is designed to afford double support to all of its shafts. The gears are made of steel forgings and heat-treated. Friction cross and length feeds are controlled by the Monarch ball-eccentric levers. An automatic length stop is furnished as regular equipment.

The driving motor can be set to drive from on top of the headstock or on the rear of the leg or, for the 18-in. standard and up, it can be set inside of the headstock leg if desired. The drive may be either by belt or chain, but the latter is recommended by the company, particularly on heavy-duty work. By properly choosing the motor speed, a range of speeds from 20 to 172 r.p.m. can be attained with constant-speed motors while variable-speed, a.c. or d.c. motors will greatly increase the number of steps possible. The company publishes a circular containing a tabulation in which the possible speeds are shown.

A 7½- to 10-hp. motor is required for the machine illustrated, which swings 18 in. over the bed and 11 in. over the carriage.

A multiple-disk driving clutch is controlled from either the apron or the headstock and operates a brake which stops further spindle rotation the instant the clutch is thrown to the off position.

Regular equipment consists of dog plates, compound rest, centers, wrenches, oil pan with pump and automatic, length-feed stop, while other special features such as special forming attachments, automatic cross feed, quick-acting tailstock and multiple toolrests are available to specification.

The lathe illustrated weighs 4,100 lb. in the 6-ft. length increasing by 200 lb. for each foot of increase in length.

Louden "Mahanite" Bearing Metal

"Mahanite," a tin-base metal, has been developed by J. E. Louden & Co., Boston 10, Mass., for general application in bearings. It is being marketed in solid bars, solid bushings and as a liner for cast-iron bushings. The bars are standard at 24 in. in length by ⅜ to 1¼ in. in diameter, but other sizes as well as tubes are available to specification. Both solid and lined bushings are furnished to order, finished or unfinished, and in all sizes.

The allowable unit bearing pressures are said to be higher than usual for this class of bearing metal. The high limit has not as yet been set by the manufacturers. A bearing under test ran cool at 600 lb. per sq.in. and 3,300 surface ft. per minute.

The material casts at 850 deg. F., using fixtures similar to those for die castings. Heat is said to have but little effect on the expansion. Moderately slow feed with relatively high speed in machining produces a long chip and results in a smooth finish. The material is secured in lined bushings by means of dovetails, all lining and relining being done at the factory. A material thickness in lined bushings of ⅛ in. for each inch of shaft diameter is recommended. Any good grade of light motor oil serves as satisfactory lubricant.

The material is said to have a peculiar cushioning effect that absorbs ordinary bearing vibrations.

SHOP EQUIPMENT NEWS

Porter-Cable Universal Milling Attachment "Hevy-Du-T" No. 5

The Porter-Cable Co., Syracuse, N. Y., has added a No. 5 model to its line of universal milling attachments previously described on page 756, Vol. 39, of the *American Machinist*.

This size is similar to the No. 4 model in that it is gear driven, but the gear ratio has been made 1 to 1 to use a fewer number of gears and the reversing mechanism has been omitted. It is intended for taking heavier cuts than any of the other sizes and is recommended for irregular and intricate work requiring end mills up to 1½ in. in diameter.

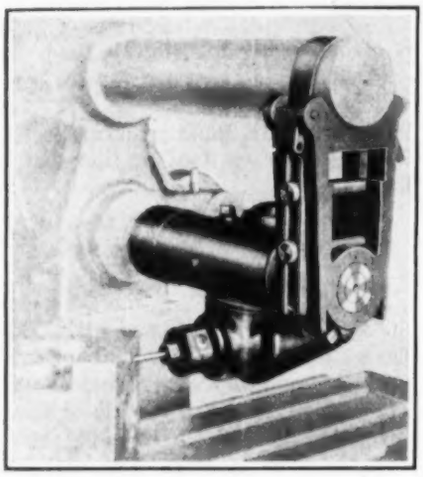


Fig. 1—Porter-Cable Universal Milling Attachment "Hevy-Du-T" No. 5

It can be equipped with a boring head for machining fixtures and drill jigs at any angle. The attachment as illustrated in Fig. 1, is set up for horizontal work, and in Fig. 2 is arranged at a compound incline.

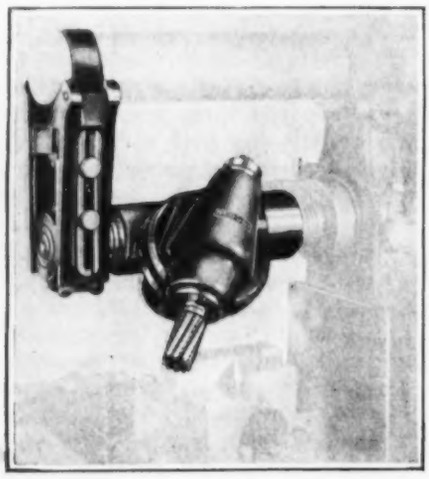


Fig. 2—A compound angle setting

It can be attached to any standard overhanging-arm milling machine and is driven by a taper arbor of correct size to fit in the machine spindle. An adjustable clamp secures it to the milling-machine arm.

The driving arbor and intermediate shaft are made of chrome-nickel steel and run in a bath of oil on S.R.B. ball bearings and Norma-Hoffman roller bearings. The gears are of the same material. The spindle is pack hardened and runs in adjustable ball bearings.

A split draw-in collet for ½-in. shank end mills is furnished with the attachment which weighs 45 pounds complete.

Reed Drilling Machine No. 5

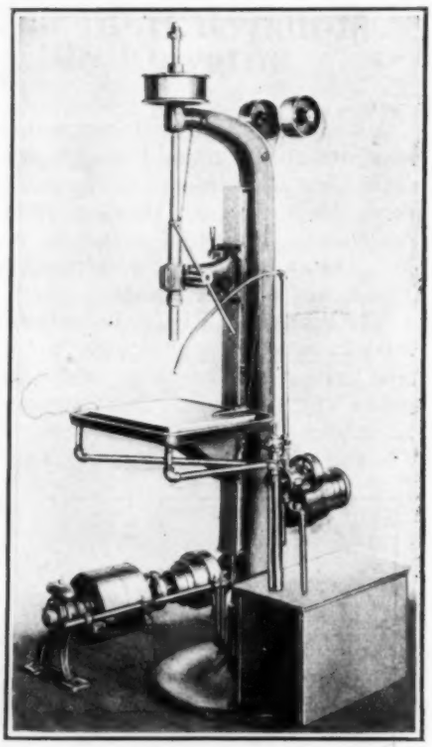
The Francis Reed Co., 43 Hammond St., Worcester, Mass., has brought out a drilling machine of the sensitive type, designed to run at comparatively high speeds and to drill holes up to ¾ in. in diameter.

In this machine both the table and the head are adjustable vertically along a flat way that is cast integral with the column, and thus the drilling point may be located at whatever height within the range may be convenient to the work. The maximum distance between the table and the end of the spindle is 30 in. The table and head are counterbalanced.

The spindle runs in cast-iron bearings that are easily renewable when worn, and the driven pulley runs upon a stationary sleeve that relieves the spindle from belt pull. A ball thrust bearing is provided at the lower end of the quill. All revolving parts are carefully balanced in order that high drilling speeds may be attained without excessive vibration.

The stud upon which the lower cone runs is located in a slide that may be adjusted up or down on the column to regulate the tension of the belt. Three-step cones on the machine and countershaft provide for a corresponding number of speed changes. The driving belt is 2 in. in width.

The table is surrounded by a channel to collect drilling compound and return it to a tank beside the base. The piping and a geared pump are regularly attached to the column and driven by a separate belt from the countershaft. The machine will, however, be furnished without these latter parts if desired. As shown, it occupies a floor space of 2x2½ ft. and weighs 350 pounds. The countershaft is included in the equipment.



Reed Drilling Machine No. 5

Metal & Thermit Corporation L. P. Brazing Compound

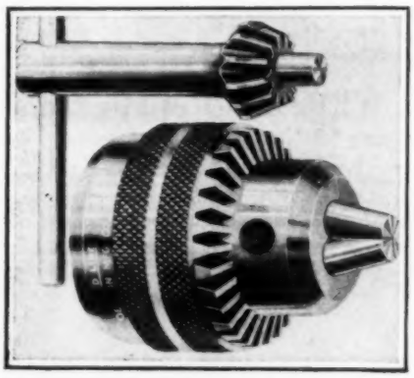
A compound for use with brazing operations on cast iron is announced by the Metal & Thermit Corporation, 120 Broadway, New York, N. Y. Its function is to protect the cast iron from oxidization at and around the joints while it is being heated and prepared for the brazing operation, the cast-iron parts having been previously thoroughly cleaned.

It is said that its use makes possible a close combination between the brass and cast iron, and that it eliminates the necessity of chamfering or otherwise preparing the parts for brazing. It is further claimed to result in an easily machinable joint. Many impartial tests have been run to try out the material, and it is these tests on which the claims for the compound are based.

SHOP EQUIPMENT NEWS

Oberlin "Red Line" Drill Chuck

The Oberlin Manufacturing Co., Oberlin, Ohio, is manufacturing the chuck illustrated in two styles. One, for general machine shop uses, ranges in sizes from ¼ to 1 in. and is made of steel. The other style,



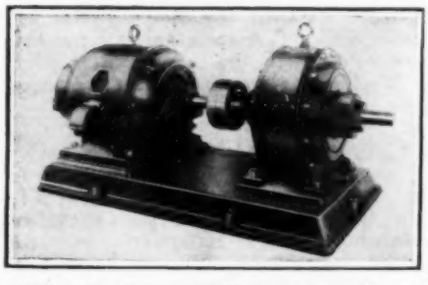
Oberlin "Red Line" Drill Chuck

which is intended for use on portable tools, is made of a special material which is said to be as strong as ordinary cold-rolled steel and to weigh only a third as much. On this style the size range has not as yet been set.

The chuck design has been altered as compared to its original construction by decreasing the length of the outer sleeve. This made it possible to increase the diameter of the main body at the rear and provide support for the length of the jaw.

Albaugh-Dover Ball-Bearing Spur-Gear Reducer

A speed-reduction unit capable of wide ranges of reduction to specification and one that includes all-ball-bearing design is announced by the Albaugh-Dover Manufacturing Co., 2100 Marshall Boulevard, Chicago, Ill. The housing is oil tight and is arranged for ample space in its base



Albaugh-Dover Ball-Bearing, Spur-Gear Reducer

to hold lubricant to flood the gears and bearings.

The driving and driven shafts enter the unit on opposite sides, and each ride in the housing on a pair of ball bearings spaced to admit a gear secured on each shaft between them. A number of countershafts, usually three, are equally spaced and set parallel to the driving and driven shafts. These countershafts ride also on ball bearings set into the sides of the housing. Each shaft carries two gears, a large one for the first reduction between driving shaft and countershafts, and a smaller one for the second reduction between countershafts and driven shaft. The arrangement is similar to that of the lathe with its back gears likened to the countershafts.

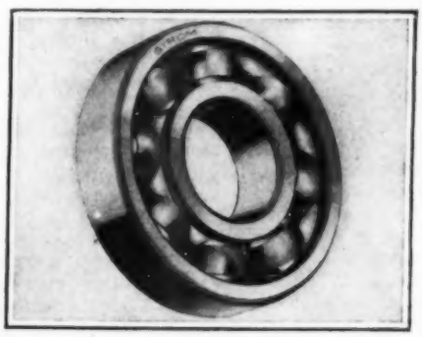
When the reduction required becomes too great for spur gears inside the housing, the countershafts are extended through to the outside where, on the driven side, they are mounted with pinions to drive an internal gear on the driven shaft. In this event, a housing extension is provided for protection which is not afforded by the housing itself.

The company is prepared to recommend the proper size of reduction unit complete with coupling on receipt of the essential data.

Strom Ball Bearing

A radial ball bearing, known as the Super-Strom, has been designed by the Strom Ball Bearing Manufacturing Co., 4530 Palmer St., Chicago, Ill., to increase the load-carrying capacity for a given size of bearing of usual construction.

Its outside dimensions make it interchangeable with other standard



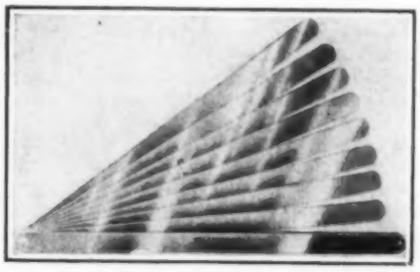
Strom Ball Bearing

bearings. The races are of the deep-groove type, however, and the balls have been increased in size or number over those usually employed in the various sizes made. The retainers are of the wide ribbon type, pressed to shape and riveted together in each space between the balls.

The bearing is made in a wide range of sizes.

Starrett Long-Leaf Feeler Gage

The feeler gage illustrated, which has been added by the L. S. Starrett Co., Athol, Mass., to its other lines of measuring tools, has been designed with extra-long leaves to meet par-



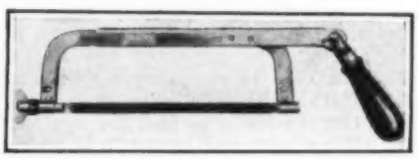
Starrett Long-Leaf Feeler Gage

ticular uses. One, for example, is in connection with checking honing or regrinding operations on automobile cylinders to take oversize pistons.

The gage has eight leaves which are respectively 0.002, 0.003, 0.004, 0.005, 0.006, 0.008, 0.010 and 0.015 in. in thickness. All are ½ in. in width by 9 in. long. They are attached to their case in such a way that they may be easily replaced should one or more become damaged.

Starrett Hacksaw Frame

The L. S. Starrett Co., Athol, Mass., has added a hacksaw frame to its line of hand tools that has been



Starrett Hacksaw Frame

designed particularly for work in cramped quarters or strained positions.

The handle can be adjusted to thirteen positions on a locking swivel and the blade may be set in any one of four directions.

News of the Week

Export Report Shows Gains Made by Machinery Sales

Best in several years census figures indicate

American exports of metal-working machinery to all countries amounted to $14,589,511 in 1924, according to statistics compiled from U. S. customs returns—representing an increase of over 20 per cent in comparison with 1922 and of approximately 8 per cent over 1923. Although the foreign demand for American machine tools may never again equal that experienced during war years, the increase in this trade since 1921 is highly satisfactory, especially when it is recalled that European competition has been particularly vigorous for the last three years.

Exports of metal-working machinery from the United States to Europe (except Balkans) last year amounted to $7,350,146 or slightly more than 50 per cent of the total and in 1923 to $4,853,729—representing an increase of 52 per cent in our exports in 1924 over 1923. Practically every country of Europe with the exception of Belgium showed decided increases in machine tool purchases from the United States last year. Exports of this equipment to France nearly doubled in 1924 and Germany's purchases gained by an amount well over 100 per cent.

Both Spain and Italy also showed an expanding market for American metal-working machinery last year, trade with the former increasing 17 per cent over 1923 and with the latter by nearly 115 per cent. Last year Russia bought metal-working machinery valued at $227,972 from the United States as against less than $3,000 worth in both 1922 and 1923.

Trade with South America

Practically every South American country with the exception of Brazil absorbed larger quantities of American machine tools in 1924 than in the preceding year. Trade with South America as a whole in this equipment showed a satisfactory recovery after the slight decline in 1923 in comparison with the 1922—metal-working machinery exports amounting to $940,515 in 1924 against $852,927 in 1923 and $857,377 in 1922. Considering the Latin American market as a whole, a decrease in exports amounting to approximately 7 per cent occurred last year, declines in the West Indian and Central American markets more than offsetting the gain made in South America.

Asia bought American metal-working machinery valued at $2,386,220 in 1923 and $2,580,792 worth in 1924—a gain of less than 1 per cent. Practically every Asiatic market with the exception of Japan, the Philippines, and the Dutch East Indies showed declines in American machine tool purchases last year. The gains made in those markets, however, slightly more than offset declines in exports to China and British India. Exports of metal-working machinery to British India declined from $717,757 in 1923 to $336,914 in 1924 and to China from $76,095 in 1923 to $51,345 last year.

Shipments of machine tools to Africa from the United States last year amounted to $247,599 and in 1923 to $158,982. This gain is obviously due to the increased demand for industrial equipment in British South Africa—the most important market on the continent. Trade with Australasia last year also showed an increase in value of equipment exported, but a decline of about one-half of one per cent in percentage of total metal-working machinery exports last year as compared with 1923.

Great Britain ranked second as a purchaser of American metal-working machinery to 1922 and 1923. Last year England ranked first, buying $3,128,208 worth of this equipment. France rose from fourth place in 1923 to second in rank in 1924, with machine tool purchases amounting to $2,058,521. A feature of last years' trade was the decline in exports of this equipment shipped to Canada—$1,751,892 worth, a reduction of more than $1,000,000 when compared with the 1923 figure.

International Chemical Salesmen Meet

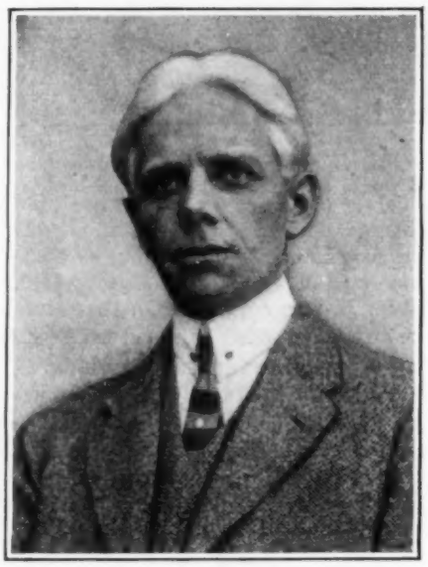
Sales engineers from middle Western territories attended the spring sectional idea conference of the International Chemical Co., of Philadelphia. This was held April 3 at the Hotel La Salle, Chicago.

Technical problems encountered in the application of potashes, cleansing compounds and lubricants were fully discussed by these trained men. Such things as methods and materials to be used in cleaning oil barrels, tank cars, paper mill felts and tire molds were carefully gone into. Results obtained on these problems in various tests were carefully compared and a general check up made.

Several very interesting technical problems that have recently been solved caused a great deal of talk, particularly the proposition of removing fuel-oil sludge from tanks, the cleaning of aluminum ham-boilers, and the cleaning of tire molds. A new material that has been perfected for heavy duty cleaning in railroad shops and a new japan stripper that strips in less than half the time than anything heretofore put upon the market, came in for discussion.

C. W. Beaver Resigns from Yale & Towne

Charles W. Beaver has resigned from the Yale & Towne Manufacturing Co., Stamford, Conn., after a connection of



Charles W. Beaver

twenty-five years. Mr. Beaver will spend the next year in travel and recreation.

Mr. Beaver joined the company in 1901 and since that time has occupied the positions of manager of the hoist department, export manager, directing manager of the subsidiary companies in Europe, general sales manager of the Yale & Towne Manufacturing Co., and vice-president and director of the Yale & Towne Co., London, Eng.

Mr. Beaver is also well known as a past-president of the Railway Supply Manufacturers' Association and for his connection with the American Supply & Machinery Manufacturers' Association.

Czechoslovakia May Lower Machinery Tariff

A new Czechoslovak law provides substantial tariff reductions on imported industrial machinery according to a cable to the Department of Commerce from Commercial Attache J. F. Hodgson, Prague.

Overflow of Exhibits at the Leipzig Fair this Year

Fair business reported by machine tool demonstrators

As an exposition, the Leipzig Fair, held during the first ten days of March 1925, was a decided success, says Trade Commissioner Theodore Pilger, in a report to the Department of Commerce from Berlin. Practically all the space available was occupied and many exhibitors were forced to show their machinery in tents out in the open. Nearly all types of machinery were shown, from the smallest precision apparatus up to the largest metal-boring mills and shearing presses. The display was thoroughly diversified so that a prospective buyer had no difficulty in finding almost any type of machine.

As a sales week, the Leipzig Fair was not very successful. In most machinery lines the sales made were for domestic installations, but even domestic sales were considered unsatisfactory by exhibitors. Export sales were extremely scarce. Prices of German standard machines are above world market levels. The machinery export trade is depressed and domestic business survives as well as it does only because of the protection afforded by restrictions prohibiting the importation of foreign machinery.

Certain machinery of a specialized type did a fair business both in domestic and foreign orders. Most prominent in this group were medium-sized compressorless Diesel engines. Orders for a fair number of these were obtained in spite of consistently high prices.

A novel apparatus displayed for the first time was the "Becker High-Pressure Quick-Steam Boiler." The small model shown was used to drive a 15-hp. steam engine. It got up 120 lb. of steam and furnished sufficient pressure to operate the engine in exactly four minutes. This boiler is fired by an automatically regulated crude oil burner that heats the tubes red-hot before the atomized water is injected. Both the flow of oil and water are automatically regulated by means of a governor.

The apparatus was the center of much interest and it is said that a considerable number of installations were sold for domestic use. The principal advantages claimed are speed of getting up steam, cheapness of first cost (about 40 per cent of standard boiler), freedom from damage due to explosion, and economy of fuel. The safety feature is due to the absence of water in the boiler, and its economy is caused by the automatic regulation of the fuel consumed in proportion to the amount of steam used.

The future of this new boiler is of course problematic. It can compete with Diesel engines in a limited field only. The life of the tubes is questionable and the difficulties resulting from boiler scale will be determined by time. But it is probable that the principle may find limited use particularly where the matter of getting up steam quickly is important.

Plan Standardization as Means of Eliminating Waste

Engineering Standards Committee launches campaign

Standardization, a new plan for eliminating waste by co-ordinating the work of large industries, is to be stressed in a campaign of the American Engineering Standards Committee. The committee has headquarters at 29 W. Thirty-ninth St. and is preparing for a national campaign.

Significance of the work undertaken was demonstrated by the personnel of the advisory committee, consisting of J. A. Farrell, president of the United States Steel Corporation; George B. Cortelyou, president of the Consolidated Gas Co.; J. W. Lieb, vice-president of the New York Edison Co.; L. F. Loree, president of the Delaware & Hudson Co.; and Gerard Swope, president of the General Electric Co.

This committee will keep executives in touch with national developments in elimination. It aims also at co-operation between industry and the government in standardization. Secretary Hoover has pledged the aid of the Department of Commerce.

This new plan to intensify the national standardization movement had its inception at a dinner attended by thirty industrial leaders, given by Mr. Farrell; John A. Freeman, vice-president of the Manufacturers' Mutual Fire Insurance Co.; Guy F. Tripp, chairman, and E. M. Herr, president of the Westinghouse Electric & Manufacturing Co.

Others present were: Walter R. Addicks, vice-president of the Consolidated Gas Co.; M. W. Alexander, managing director of the National Industrial Conference Board; W. W. Atterbury, vice-president of the Pennsylvania Railroad; Willis Booth, president of the International Chamber of Commerce; John A. Coe, president of the American Brass Co.; C. P. Coleman, president of the Worthington Pump & Machinery Co.; Edward J. Cornish, president of the National Lead Co.; J. M. Davis, president of Manning, Maxwell & Moore, and Henry L. Doherty

Also Colonel John H. Finney of the Aluminum Co. of America; Norman J. Gould, president of the Gould Manufacturing Co.; Bancroft Gherardi and Dr. Frank B. Jewett, vice-presidents of the American Telephone & Telegraph Co.; Robert Lamont, president of the Steel Foundries Corporation; James H. McGraw, president, and E. J. Mehren, vice-president of the McGraw-Hill Co.; Frank W. Smith, vice-president of the United Electric Light & Power Co.; L. S. Storrs, president of the Connecticut Co.; Charles B. Seger, president of the United States Rubber Co.; A. A. Stevenson, vice-president of the Standard Steel Works Co.; A. W. Whitney of the National Bureau of Casualty and Surety Underwriters; C. E. Skinner, chairman, and P. G. Agnew, secretary of the American Engineering Standards Committee.

Franklin Institute Honors Hodgkinson

In the presence of a large and distinguished gathering at the old Franklin Institute on April 15, the Elliott Cresson gold medal, one of the highest honors conferred by the Franklin Institute, was presented to Francis Hodgkinson, chief engineer of the South Philadelphia Works of the Westinghouse Electric & Manufacturing Co.

Francis Hodgkinson

The presentation was made by Dr. William C. L. Eglin, president of Franklin Institute, at the regular stated meeting, which was preceded by a private dinner at the Bellevue-Stratford Hotel. The award, according to the official announcement, was made to Mr. Hodgkinson in recognition of his achievements in the field of steam turbine design and construction during the past thirty-one years.

Mr. Hodgkinson, who was born in England, received his primary education at the Royal Naval School at New Cross, London, finishing in 1882, whence he began his apprenticeship serving for the succeeding three years.

In 1896 he joined the Westinghouse Machine Co. in charge of the engineering and designing of the Parsons type turbines and in 1916 he was made chief engineer of the Philadelphia plant.

Traut & Hine May Merge With North & Judd

Officials of the Traut & Hine Manufacturing Co., New Britain, Conn., have voted to recommend to the stockholders that the company merge with the North & Judd Manufacturing Co., New Britain, manufacturer of saddlery hardware and metal specialties. The terms are still to be worked out.

Personals

G. S. TRACY has been made advertising manager of the National Acme Co., Cleveland, succeeding L. E. HONEYWELL, who has resigned.

JAMES VAN BUSKIRK has been transferred from the Detroit to the Birmingham office of the Harnischfeger Corporation, Milwaukee.

DR. CARL BENEDICKS, director of the Metallographic Institute of Stockholm, Sweden, who has been visiting in the United States, returned to Sweden on April 18.

BOETICH H. SULLIVAN has resigned as chairman of the board of directors of the Independent Pneumatic Tool Co., Chicago, and has been succeeded by JOHN A. MCCORMICK of the Chicago Trust Co.

LAWRENCE P. FISHER has been named president and general manager of the Cadillac Motor Car Co., Detroit, succeeding H. H. Rice, who has been made assistant to the president of the General Motors Corporation.

C. E. DONEGAN is the district sales manager in charge of the recently opened Minneapolis office of the Linde Air Products Co., New York. His headquarters are at 716 First National Soo Line Building.

ROBERT STROUD, for the past fifteen years in charge of the manufacturing branch of Wettlaufer Bros., Ltd., will be general manager of the new Wettlaufer-Mitchell Machinery Co., Mitchell, Ontario.

HARRY B. GILMORE has been elected secretary of the Western Electric Co. He succeeds George C. Pratt, who has resigned.

JOHN M. OLMSTED has been appointed general manager of the engineering products division of the Walworth Co., Boston, and will make his headquarters in Chicago.

J. A. GELZER has been appointed sales manager of the automotive division of the Wagner Electric Corporation, St. Louis, Mo.

S. I. FEKETE has been appointed chief engineer of the Hudson Motor Car Co., Detroit, Mich., succeeding G. H. BEHN resigned. Mr. Behn will serve the Hudson company in a consulting capacity under the title of advisory engineer.

EDWARD VER LINDEN has been elected president of the Peerless Truck & Motor Corporation, Cleveland. Mr. Ver Linden was recently elected president and general manager of the Peerless Motor Co.

A. G. HILL, Toronto, has been appointed Canadian agent by the Marion Machine Foundry & Supply Co., Marion, Ind.

L. J. BELKNAP, president of the Rolls-Royce Co. of America, has resigned, but will remain a member of the board of directors. H. C. BEAVER, who has been treasurer, has been elected vice-president in charge of operations.

W. A. K. KOPP has been made district manager of the Birmingham office of the Linde Air Products Co., New York. His headquarters will be at 409 Lincoln Life Building.

R. N. AUSTIN, manager of the Turbine Equipment Co., Ltd., Toronto, has been appointed manager of the Canadian Austodis Chimney Co., Ltd.

G. D. GRUBB is the district sales manager in charge of the Tulsa, Okla., office of the Linde Air Products Co., New York. His headquarters are at 508 Exchange National Bank Building.

H. E. NEUBAUER has joined the organization of the Chemical & Vacuum Machinery Co., Buffalo, N. Y. He was formerly connected with the Buffalo Foundry & Machine Co. and the O. S. Sleeper Co.

HENRY G. PUFFER has been appointed vice-president of the Canadian Equipment Co., Ltd., and manager of the Toronto office.

EDMUND C. MAYO, formerly president of the American Tube & Stamping Co., Bridgeport, Conn., has been elected president of the Gorham Manufacturing Co., Providence, R. I.

Obituaries

PETER J. CONNOR, aged 60 years, mechanical engineer on the staff of the Gisholt Machine Co., Madison, Wis., since 1897, died April 12 after a long illness. He was born in Hamilton, Ohio, and was graduated from Cornell University in 1890, joining the Gisholt staff seven years later. He was an inventor and designer of note, and an author of technical publications which have received wide circulation.

J. J. REDMOND, vice-president of the Fulton Iron Works, St. Louis, Mo., died April 8 at Recife, Brazil.

ELWOOD HAYNES, inventor of America's first automobile and internationally known as a scientist and metallurgist, died April 13 at his home in Kokomo, Ind. For many years he was the president of the Haynes Automobile Co. and later organized the Haynes Stellite Co., which was later purchased by the Union Carbon & Carbide Corporation. Besides the automobile, Mr. Haynes was the inventor of many parts of automobiles such as mufflers and carburetors.

A. LOWENER, a well known importer of American machine tools in the Scandinavian countries and a representative of more than twenty American firms in that part of Europe, died at his home in Copenhagen, Denmark, April 14, at the age of about sixty years. Mr. Lowener was the owner of the firm of V. Lowener of Copenhagen, and was also largely interested in the firm of A. B. Lowener in Stockholm, Sweden, and the firm of Lowener-Mohn in Christiania, Norway. Mr. Lowener was one of the pioneers in the importing business of American machine tools to Europe. He was a man of unusual business organizing ability and the system and methods employed in his Copenhagen business greatly impressed all visitors.

Business Items

The New York office of the Kearney & Trecker Corporation, Milwaukee, Wis., has been moved to 1610 Singer Building.

The Chicago district sales office of the Whiting Corporation has been moved from 945 Monadnock Block to 1502 Railway Exchange.

The Wettlaufer-Mitchell Machinery Co., Mitchell, Ontario, has been incorporated in Canada with a capitalization of $480,000 to carry on a general manufacturing business, specializing in the manufacture of concrete machinery, contractor's equipment and similar lines.

The plant of the Muskegon Castings Co., Muskegon, Mich., will be opened May 1 for the manufacture of malleable castings for the automobile, railroad and agricultural industries.

The Derby Motor Cars, Ltd., expects to commence manufacturing operations at Saskatoon, Saskatchewan, toward the end of April. The company is capitalized at $1,500,000. The officers are: L. M. Arsenault, president and general manager; F. E. Betts, vice-president and assistant general manager; C. E. Meadows, treasurer, and L. A. Brodeur, secretary. The company has a contract with the George W. Davis Motor Car Co., Richmond, Ind., that gives it the sole right to import the Davis car in units, assemble it and market it in Canada and abroad under the name "Derby".

The London headquarters of the Selson Engineering Co., 120 Liberty St., New York City, has been moved from 83 to 85 Queen Victoria St., to the Selson Buildings, 26 and 28 Charles St., E.C.1, London, Eng.

The New York office of the Chase Companies, Inc., Waterbury, Conn., has been moved to 138 Lafayette St. The Chase Companies Inc., include the Chase Metal Works, the Waterbury Manufacturing Co., and the Chase Rolling Mills.

The Oneida Manufacturing Co., Green Bay, Wis., has been acquired by the Railway Motors Corporation, Chicago.

Equipment is now being installed in the new plant at Hamilton, Ontario, of the Three-Way Piston Ring Co. of Canada. The plant is designed to take the place of one now located at Simcoe, Ontario, which is not large enough to keep pace with the growth of business.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, has opened a new office at 203 E. Fifteenth St., New York City.

The Wagner Electric Corporation, St. Louis, Mo., has moved its Pittsburgh service station to 4909 Liberty Avenue.

The Firth-Sterling Steel Co., E. S. Jackman & Co., agents, has moved from the old warehouse at 333 Frankfort Ave., Cleveland, to its new location at 1424 E. 25th St., N. E. The home office of this company is at 710-716 W. Lake St., Chicago.

American Machine Tools Needed by Many French Industries

Business progresses slowly in spite of political handicaps

By Our Paris Correspondent

It should be gratifying to the American manufacturer and exporter of tools, machinery and hardware to know that imports from the United States increased in 1924, as compared with 1923, by nearly three and a qaurter million francs in value. Machine parts advanced from 35,601,000 francs to 51,065,000 francs. Furthermore, in each case the 1924 imports were still further ahead of those of 1922 than those of 1923. The first named approximately 30 per cent and the latter 250 per cent, which is a formidable advance. "Machines, steam and other," as is the French classification, advanced to 318,247,000 francs in 1924 from 228,659,000 francs in 1923, and 133,870 francs in 1922.

For the first time since the war iron and steel imports from the United States fell off amazingly, above all as compared with the figures of 1922. They were even less than those of iron and steel exports to the United States from France. The cause of this is undoubtedly the greatly increased production facilities, which may be said to apply to all metal manufacturing industries. The low exchange value of the franc made this possible, in spite of the fact that this of itself has not affected the tool and machinery trade as it otherwise might. It is this latter condition solely that has made it possible for France to sell her overproduction of pig iron and steel in the United States.

Of home and foreign trade conditions there is little change from what has obtained during the past few months. Interior metallurgical demands have improved slightly in volume, but not all quotations offered have been turned into orders. German competition is ever hanging over the French industry in world markets. Germany has lifted an order for locomotives from the Egyptian State railway in face of both British and French competition.

Orders from Russia

France is looking forward to motor truck orders from Soviet Russia in accord with a quasi-agreement made when "recognition" was granted. Moscow alone is said to be in the market for 300 motor bus chassis and 300 motor trucks of 3½-ton capacity.

The order for rolling stock for French railways that was given to German firms is still a matter of live criticism in spite of the fact that this was provided for by the Wiesbaden agreement before the Dawes plan went into effect or was even thought of, hence the argument that the Dawes plan is working disastrously for France falls to the ground. The orders placed with the Bahnbedarf Gesselschaft of Darmstadt and the Gockelwerke of Neuweid were inferior by 30 per cent to those originally negotiated by Monsieur Loucheur. The final endorsement of the order will come from the French government if finally it is not abrogated. The order was for 4,500 freight cars, valued at 62,000,000 francs.

Private plants producing railway equipment and motive power are continually protesting of the paucity of business to be obtained from French railways and assert that if this condition obtains a real crisis will arise in the industry. Meantime several of the large companies are expanding their own repair and fitting-out plants and re-equipping them where necessary. This is bound to take a share of the work out of the hands of those to whom it formerly went, though it will offer a more or less potential line of business for tool and machinery makers as time goes on. The State railway is just putting into operation a locomotive repair shop at Scotteville-les-Rouen that was begun as long ago as 1913. Already a thousand men are employed.

A notable volume of business was recorded during the past year in the machinery, machine tool and allied industries of Lyons in mid-France. Especially was this true with regard to automobiles and motor trucks and machinery for the textile industry. In the past two months there has been a slowing down, but orders for textile machines have been received from Italy in satisfactory quantities and exports of various forms of machine tools have been received from Brazil and the Argentine.

The general automobile industry lags, though 1925 is supposed to promise satisfactory export business. The printing machinery and electric apparatus manufacturers are not oversupplied with orders, but heavy electrical machinery plants are in a more satisfactory condition. The increase in the output of French agricultural machinrey and tools is still in the ascendant.

The annual Lyons fair has closed with more than usually satisfactory returns in the volume of orders received. The machinery and machine tool sections reported satisfactory export orders as a result. The difference in method between the Lyons fair and that of Leipzig is that the former quotes only for products taken for delivery in France, whereas the German manufacturers showing at Leipzig still continue the practice of quoting for their product laid down at the door of the buyer, be he in Brazil, Java or San Francisco. For this reason there is difficulty in establishing a complete comparison of prices between any special items in which the two countries may be competing.

Notes of Washington Activities

By Paul Wooton

Secretary Hoover is familiarizing himself rapidly with the problems of the Patent Office, the bureau recently transferred from the Interior to the Commerce Department. He has paid particular attention to the questions involved in foreign patent regulations that have a bearing on American inventors.

The committee on Patent Office Procedure, of which Thomas Ewing is chairman, which was appointed by Secretary Work, has been continued by Secretary Hoover. He will add three or four engineers to the committee as he believes organization and methods are in need of more study than patent law and court procedure in patent cases.

The engineers when named will be assigned to the subcommittee on procedure, of which L. W. Wallace is chairman.

At the request of the committee additional space has been provided for the Patent Office staff. Congestion in the Patent Office itself has made it necessary to transfer several divisions to other quarters. Space will be provided in the old Land Office building, which is just across the street from the Patent Office. Thus far the committee has approved the following recommendations:

"We ask that you urge the immediate assignment to the Patent Office of additional space in the Land Office building, the amount of additional space to be that amount which the Commissioner deems will be necessary to care for a number of new divisions, and other requirements, as well as to provide for the probable growth during the next four or five years.

"That because of the intolerable housing situation—the wastefulness, the unwholesomeness and the risks of it—we strongly urge that the Government build and equip, at the earliest possible moment, a building for the Patent Office, the building to be designed and constructed for the special needs of the Office and of ample capacity to provide for the growth thereof for many years to come.

"That Congress be urged to make such an appropriation without delay, as will permit the replacing of all wooden shelves and file cases with steel cases, this to be done in the interest of fire protection, conservation of space and expedition of the work.

"That the attention of the Personnel Classification Board be called to the discrepancy in nomenclature relating to the employees of the Patent Office and that the board be requested to correct the nomenclature so as to conform to the statutes.

"That the Personnel Classification Board be requested to include in its specifications that the Examiners-in-Chief are required to have scientific as well as legal training and ability as provided in Section 482 of the Revised Statutes.

"That the Personnel Classification Board be requested to have the Commissioner placed in Grade 7 and the Assistant Commissioners in Grade 6."

A long list of further recommendations are being considered by the committee.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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THE sea of business was comparatively quiet last week, but there was enough motion to make it plain that the law of supply and demand was operating normally and with less speculative deflection than usual.

The railroad traffic indicates that goods are moving freely and the bank clearings reflect an acceleration in the circulation of money, but the increases shown are not sensational and nothing like a boom is visible anywhere. This is salutary but it is not exciting, and to those who had expected a spring of sensational activity, it is disappointing.

In the stock market there was a further recovery from the low prices reached about the first of the month, but it was due to the covering of shorts rather than to new buying and a comparatively quiet summer seems to be ahead of us unless something unlooked for happens to disturb the present equipoise.

Money is a shade easier as a result of the recent liquidation, but close students of financial statistics continue to insist that an unduly large share of the country's banking resources is employed in carrying securities. Upon this hypothesis it is argued that a period of leisure for assimilation is necessary if indigestion is to be avoided.

There is force in the argument, for it is difficult to believe that the six billions or more of new securities brought out during the last fifteen months have gone into the safe deposit boxes of those who intend t. hold them permanently.

This is particularly true of foreign obligations, and the politico-economic predicament of France has caused no little reselling of the French and Polish dollar bonds placed in this country. French francs have been surprisingly steady as but few are held here and American bankers seem presently unwilling to draw heavily upon their correspondents in Paris.

It is realized that the productive capacity of America's industrial equipment is rather in excess of our purchasing power at present prices, and this fact is about the only feature that need give us any concern at present. It is apparent in the markets for coal, steel, copper and most other mineral products, as well as in the shoe industry, the textile industry and the automobile industry.

But it is not to be expected that supply and demand will ever be in a perfect adjustment and in the industries named intelligent efforts to keep production within the limits of consumption are being mac'e.

One result has been a slightly lower price level and the markets generally are now "in favor of the buyer." But no serious declines have been registered nor is there any reason why distributors should hesitate in filling their legitimate requirements.

What's Doing in Industry

More cheerful reports were received from the various machine tool centers of the country this week indicating an improvement in present business and further betterment expected. Detroit reports greater activity with the automotive industry preparing lists to be issued soon. Cincinnati reports an increase in demand for all kinds of machinery and both builders and dealers busy. Chicago says that dealers are encouraged by the outlook for a better market in the near future. New York notes better buying by the railroads and electrical companies and a greater number of inquiries. New England reports that production in some factories is the best since the War and exports during the past six months have been very good. Canada says general industry has improved led by the agricultural machinery makers. Other cities are equally as cheerful.

Following a quiet two weeks, caused by an almost total absence of railroad buying, the foregoing reports have restored an air of confidence in the industry that has been lacking since the first few weeks of the year. With the railroads back in the market, the automotive industry going ahead at a faster rate than for some time and with a chance of bettering last year's figure, general industrials buying for expansions and replacements, and exporting continually improving, the outlook is encouraging for several weeks to come.

While figures for April will probably show up unfavorably as compared with those of March, it is possible that they will equal business done during the first two months of the year. When it is considered that these months were better than any of the previous eight, April will not be classed as a dull month. The average for the first quarter of the year shows steady improvement.

The agricultural commodities will of course be responsive to the weather and no one can tell what cotton and grain will do. The news from either the grain fields nor the cotton belt is very reassuring, but it has not made much impression on prices as speculators realize that there is plenty of time for improvement.

At about 2.85 for July delivery in New York, Cuban raw sugar shows a decline of nearly 25 points, which is about 8 per cent of its value at the already low prices current a week ago. Those who ought to know say that it is well below the cost of production and it is being extensively bought by many who describe themselves as "speculative investors." The decline which has carried sugar to within less than a cent a pound of the lowest prices on record is due to increased estimates of the Cuban crop, but at under three cents a substantial increase in the world's consumption is probable.

There have been no changes of importance in the other commodity markets. Retail business is described as fair, but some dealers complain that President Coolidge is making economy fashionable. If this be true he is doing a great service, for now and always "Economy is the road to wealth" and it never injures those who practice it.

That it will avert a boom is certain, but the circumspection in buying and the subsidence of speculation that are generally noticeable afford the surest guarantee of sound prosperity.

The weekly statement of the Federal Reserve System shows no changes that need exposition and in the financial as in the commercial world stability seems to be indicated in the immediate future.

Our foreign trade is apparently unaffected by the financial difficulties abroad and the figures for March and the nine months ending with March are highly satisfactory. This is interesting for it shows that during the nine months we have been able to send abroad gold and merchandise that was worth $1,043,000,000 more than the gold and merchandise that we imported. In settlement of this balance we have in effect accepted promises to pay, and our ability to lend such an enormous sum without cramping our domestic trade is impressive evidence of our opulence and prosperity.

But it also shows that we must continue to lend in order to sell our surplus production abroad, for our domestic markets would be paralyzed if our imports of foreign merchandise equalled our exports. This is why anything that may impair European credit in America is so important to us.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

New York

Some improvement was noted in the New York machinery and machine tool market this week with an increase in the number of inquiries, some orders from industrials and a few closings on small railroad lists that have been out some time. The Central of Georgia is reported having closed on several tools, while other railroad buyers were the Erie, the Lehigh Valley and the New York Central.

The electrical companies were in the market for tools with the General Electric Co. asking on a rather sizeable list. Locomotive builders were also heard from as well as a noticable improvement in the demand from the automotive industry.

Indications would point to more activity during the last half of the month than in the first half, with an average less than March, but about equal to the first two months of the year. Most dealers agree, however, that it will take an unexpected buying "orgy" to bring the April business up to that accomplished in March.

Exports were active during the past two weeks with further improvement looked for from now until June 1. England and Germany still lead in overseas buying with rumors to the effect that Japan will re-enter the market within a short time. There has also been some talk of indirect buying by Russia for railroad repair shops in Moscow.

Buffalo

The fortnight has revealed comparatively little change in the machine tool market of Buffalo. It continues to be extremely spotty with business reports slightly less favorable than on the first of April. Most reports indicate, that at the present pace, the April business as a whole will not be as good as that of March.

It may be interesting to note that many of the firms reported that a closing of the books for the month of March showed that business was actually better in that month than in either of the two preceding months. In view of that fact the possibility again arises that perhaps, because of the New Year's predictions and the ultra-optimistic tone of business at that time, too much was expected in the way of business in this and in other lines.

One dealer advanced the information that a survey by his office showed that there are comparatively few idle industries either in Buffalo or within the district. It is this man's theory that many of these industries have been really active for only a comparatively short time. Many are doing business on a volume basis for the first time in months or years and he believes that it is perfectly natural for some of them to build up a surplus before any buying is done which is not of absolute prime necessity. He states that if the volume of business with those industries continues at or near the present pace they will, within a few months, become very good machine tool equiptomers.

One dealer in cranes and road equipment reported business to be very good. Many of his regular customers have obtained excellent contracts for the year and they are buying new equipment this year more liberally than in some time past. This company sold four cranes of various sizes during the last thirty days as well as two big pavers and considerable other equipment.

A salesman for a large dealer returned recently from a ten-day trip throughout the western end of the state and reported that most industries were very active, but were not buying to any extent at the present time, although he could see no reason why many of them will not be in the market for equipment in later weeks.

Cincinnati

Considerable increase in demand for all classes of machine tools during the week is reported by manufacturers, and likewise dealers state that orders are coming in more freely. As a result, there is a greater air of cheerfulness and confidence among the trade than has been manifest for some time, and the feeling is that normal times are close at hand.

This increased demand, it is stated, comes from all parts of the country, which is taken to be a good omen, indicating that prosperity is gradually returning to all sections and is not merely local in its nature. Sales made to date clearly indicate that at its close April will prove to be the best of the first four months of the year.

Several machine tool plants report that they now are working full time, and some report that they expect to add more employees within a few days. The demand for the smaller tools seems to be better than the demand for the large, but manufacturers and dealers report an increased sale of both classes.

Railroads are still sending in a considerable number of inquiries, and the outlook from this field is considered good, in spite of the fact that the placing of the orders is still delayed. It is felt that the inquiries show that the railroads are in need of the tools and, therefore, the purchases cannot be delayed much longer.

Quite a few orders have come from the automotive industries this week, and the prospect for increased sales in that field are considered bright. General machinists and industrial plants in all parts of the country are ordering tools and replacement parts more freely, which indicates that they are becoming more active. Taking all things into consideration, manufacturers and dealers feel that the past week has been the most encouraging of the year.

Detroit

Greater activity has been noted in the machinery and machine tool fields in Detroit and southestern Michigan during the past few days. Automobile plants are preparing extensive lists of machinery and other equipment, and advices received by leading representatives in the machine tool industry are to the effect that larger production in the motor car factories means the installation of more modern machines.

A very large proportion of inquiries being received by dealers is resulting in actual orders. The demand for drills and gear machines recently has been quite heavy in this section.

Inquiries have been received from the Whitehead & Kales Co., and the Detroit Showcase Co.

Bids for the construction of an open hearth building for the Ford Motor Co. plant at River Rouge are being secured by the architect. Equipment for the building will be purchased some time this summer, it is understood.

A 16-ft. vertical boring mill has been ordered for the locomotive erecting shops of the D. T. & I. R.R. at the River Rouge plant of the Ford Motor Co. Two 5-ft. radial drills have been recently installed in the shops. Equipment in the air-brake department at the plant has been increased by an improved lapping machine and a triple valve gear machine, both of which are time-savers.

New England

Production in the machinery trade of the New England field is fairly good and the concensus of heads of corporations is that the near future is more promising. A manufacturer qualified his statement by saying that he based his opinion on the plant's present capacity. His company expanded 200 per cent during the war period and on that basis the present business of the company is far ahead of what previous to the war was regarded as "normal." The inquiry was pressed further and disclosed that operations are now at the highest point since the "war boom."

Other manufacturers indicated that the present output of the plants was the basis of their optimistic attitude. One of them said that employment in the plant is approximately as large now as at any previous time and operations are on full working schedules.

The character of buying during the past week has been general, with a

good volume of orders from the automotive, the railroad and the manufacturing lines. The head of a manufacturing company commented that recent buying has been of the character prevailing before the war—that it is conservative but farsighted.

Buying for export shipment has been better in the past six months than at any time since the war.

Small tool buying has been active. The bulk of this business has largely been of the replacement variety.

Canada

With the opening up of spring and increasing activity in out-door operations, a general improvement in industrial and business activities in Canada is reported. Agricultural implement factories report increased business compared with that of last year, which reflects the enlarged purchasing power of the farming communities.

Steel mill production is being maintained to a considerable extent by rail business.

Automobile factories are unusually busy. The Commercial Motor Bodies & Carriages, Ltd., is working overtime and reports splendid prospects for the next few months. Durant Motors of Canada, Ltd., reports that cars are being built at the rate of 75 per day at its Toronto plant and efforts are being made to increase this production to 100 cars per day.

Chicago

Dealers in machine tools and special machinery are inclined to feel somewhat encouraged at the outlook for a better market in the near future, inquiries having increased to a slight degree within the last few days.

Enlarged production among manufacturers, while not of the extent there seemed reason to expect and upon which hopes for good business have been built, is perceptible, according to figures published. This fact affords grounds for the belief that the industrial demand for machinery will improve. Just at present, however, the chief reliance of dealers rests on railroad requirements. The greater proportion of these have been made known and bidders who have submitted figures are expectantly awaiting decisions as to the closing of sales. Coming within this category are the 50 or more machine tools listed and inquired for by the Illinois Central R.R. for its Chicago yards.

Calendar of Local Meetings

Cincinnati, Ohio. April 23. "The New Miami Station of the Union Gas & Electric Co.," C. W. DeForest. Prof. J. T. Faig, secretary, Ohio Mechanics' Institute, Cincinnati, Ohio.

Toledo, Ohio. April 23. Afternoon and evening sessions. "Oil and Gas Power." Dr. Druse. H. L. Allen, secretary, the Toledo Scale Co., Toledo, Ohio.

Washington, D. C. April 23. "Diesel Engines in Submarines." E. C. Magdeburger. H. M. Roesser, secretary, the United States Bureau of Standards, Washington, D. C.

Los Angeles, Calif. April 23. "Conservation of Oil and Gas Fuel." R. M. Peabody, secretary, 1201 W. Second St., Los Angeles, Calif.

Atlanta, Ga. April 24. Joint meeting with A.S.C.E., and A.I.E.E. "The Use of Oil-Fired Furnaces in Residences." A. M. Schoen. E. W. Connell, secretary, 41 Miller Ave., Atlanta, Ga.

Denver, Colo. April 24. "Shop and Production Methods in the Burlington Shops of Denver." Charles Erwin. William Lester, secretary, the Vulcan Iron Works, Denver, Colo.

Columbus, Ohio. April 24. "Oil and Gas Power." H. F. Shepard, J. E. Dykatra and L. H. Morrison. Arthur Richards, secretary, Chillicothe, Ohio.

Spokane, Wash. April 24. "Motor Fuels of the Future." L. S. Pospisil. L. J. Pospisil, secretary, Washington Water Power Co., Spokane, Wash.

Minneapolis, Minn. April 27. "Commercial Oil Burning." Edward Larkin. Prof. B. J. Robertson, secretary, the University of Minnesota, Minnapolis, Minn.

Portland, Ore. June 22 to 25. Pacific Coast Regional Meeting.

Society of Automotive Engineers

Los Angeles Section. April 24. "Los Angeles Major Traffic Plan." David R. Faries. "Can Motor Buses Relieve Congestion?" Phil. Harris.

Washington Section. April. 24. "Around the World Flight." Lieuts. Leigh Wade and Leslie P. Arnold.

San Francisco Group. April. 30. "Six-Wheel Trucks." Ethelbert Favary.

Milwaukee Section. May 6.

Pennsylvania Section. May 12. Trip to Naval Air Station, Lakehurst, N. J., with talk by Naval officers.

Buffalo Section. May 19.

American Society for Steel Treating

Schenectady, N. Y. Spring Section Meeting. May 28, 29 and 30. Hotel Van Curler. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

National Association of Cost Accountants

Philadelphia Chapter. May 8. "Material Control." N. M. Cartmell.

Milwaukee Chapter. May 12. Annual election of officers.

New York Chapter. May 12. "Cost Accounting to Aid Financial Control and Forecasting." S. H. Childs.

Buffalo Chapter. May 14. Annual election of officers.

Twin Cities Chapter. May 14. A review of all previous topics of the series. Election of officers.

Cleveland Chapter. May 20. "Retailing-Reaching the Consumer," and "Uniform Costs for the Retailer."

Rochester Chapter. May 20. "Methods of Applying Selling and Administration Expenses to the Product." Prof. Charles Reitell.

Syracuse Chapter. May 20. Subject to be announced. Percy S. Brown, the speaker.

Detroit Chapter. May 21. "Experience in Simplifying the Cost System."

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile and electrical machinery. Poona City, India. Agency. Reference No. 14,438.

Electric motors, small tools, machine tools and woodworking machinery. Cape Town, South Africa. Agency. Reference No. 14,424.

Electric motors, controlling apparatus, recorders and meters, drills. Brussels, Belgium. Agency. Reference No. 14,454.

Grinding and polishing materials, and small tools. Amsterdam, Netherlands. Purchase and agency. Reference No. 14,430.

Small tools. Torun, Poland. Agency. Reference No. 14,425.

Small tools. Wellington, New Zealand. Purchase and agency. Reference No. 14,426.

Cylinder head gaskets, and rings for pistons. Alexandria, Egypt. Agency. Reference No. 14,403.

Automatic machine tools. Dresden, Germany. Purchase. Reference No. 14,445.

Machine tools and mining appliances, pumps. Brussels, Belgium. Agency. Reference No. 14,447.

Trade Catalogs

Ball Bearings. The New Departure Manufacturing Co., Bristol, Conn. Ball bearings in the motor car and the efficiency of the products of this company are told in a four-page folder. The first page bears a cartoon illustration and the inside pages contain a letter from the Miller Engine Works, Los Angeles, Calif., with comments.

Drill Rods. The Firth-Sterling Steel Co., McKeesport, Pa. Lists, specifications and prices are contained in this compact catalog recently issued. It is handy for reference.

Speed Reduction Units. Boston Gear Works Sales Co., Norfolk Downs, Mass. The various types of speed reduction units with tables of specifications and prices are shown in this catalog recently issued. It is called "Speed and Power," and makes a handy reference book.

Forthcoming Meetings

American Welding Society. Annual Meeting. April 22, 23 and 24. Engineering Societies Building, 29 West 39th St., New York City.

The National Supply and Machinery Distributors' Association. Twentieth annual convention, Ambassador Hotel, Atlantic City, April 27, 28 and 29. George A. Fernley, secretary and treasurer, 505 Arch St., Philadelphia, Pa.

Southern Supply & Machinery Dealers' Asoication and the American Supply & Machinery Manufacturers Association, Joint Convention. The Atlanta-Biltmore Hotel, Atlanta, Ga., May 5, 6 and 7. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

The Society of Industrial Engineers, National Convention. Hotel Winton, Cleveland, Ohio, May 6, 7 and 8. Executive secretary, George C. Dent, 608 S. Dearborn St., Chicago, Ill.

American Gear Manufacturers' Association. Ninth annual convention, May 6, 7 8 and 9. The William Penn Hotel, Pittsburgh, Pa. T. W. Owen secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Spring Meeting. Milwaukee, Wis. May 18, 19, 20 and 21. Calvin W. Rice, secretary, 29 West 39th St., New York City.

United States Chamber of Commerce. Thirteenth annual meeting, Washington, D. C., May 20, 21 and 22.

Division V of the American Railway Association. Business meeting June 16 to 18, Chicago. V. R. Hawthorne, 431 S. Dearborn St., Chicago, Ill.

Society of Automotive Engineers. Summer Meeting. Greenbrier Hotel, White Sulphur Springs, W. Va., June 16, 17, 18 and 19. C. F. Clarkson, secretary, 29 West 39th St., New York City.

American Society for Testing Materials. Twenty-eighth annual meeting. Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 22, 23, 24, 25 and 26. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

National Foreign Trade Council. Annual Convention. Seattle, Wash., June 24, 25 and 26. O. K. Davis, secretary, India House, Hanover Square, New York City.

American Railway Tool Foremen's Association. Annual convention, Hotel Sherman, Chicago, Ill., in August. G. G. Macina, C. M. & St. P. Ry., 1402 Calumet Ave., Chicago, Ill.

International Railway General Foremen's Association. Annual convention, Hotel Sherman, Chicago, Sept. 8, 9, 10 and 11. William Hall, secretary and treasurer, 1061 W. Wabash St., Winona, Minn.

New Haven Branch of the American Society of Mechanical Engineers. Fifth annual machine tool exhibition. Sept. 8 to 11. Mason Laboratory. H. R. Westcott, chairman.

American Society for Steel Treating. Annual Convention and National Steel Exposition. Public Auditorium, Cleveland, Ohio. Week of Sept. 14. W. H. Eisenman, Secretary, 4600 Prospect Ave., Cleveland, Ohio.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Calif., Long Beach—Perfect Caster Mfg. Co., 3517 East 11 St., C. E. Brockman, Sales Mgr.—Cleveland automatic screw machine, 7 Model B, Lashbauch-Jordan punch presses.

Ill., Chicago—All American Radio Corporation, 4201 Belmont Ave., E. N. Rauland, Pres. (manufacturers of radio sets)—motors, lathes, drills, saws, and machine tools, for new plant.

Ill., Chicago—Atchison, Topeka & Santa Fe R.R., Railway Exchange Bldg., M. J. Collins, Pur. Agt.—Boyd & Emmes, or equivalent 16 in. x 10 ft. heavy duty engine lathe; 20 in. x 8 ft. heavy Hendey or equivalent engine lathe; 2½ Landis or equivalent double head heavy duty belt driven bolt cutter, 54 in. vertical heavy duty boring mill; 2 in. Landis or equivalent bolt cutter; Lucas or equivalent 50 ton driving box press. Whitney or equivalent single wet tool grinder, 20 x 2½ in. wheel; double dry emery grinder machine, with two 24 x 3 in. emery wheels; 1½ in. National or equivalent bolt heading machine; heavy duty double head bolt cutter.

Ill., Chicago—Bauer Mfg. Co., 119 East 30th St., P. Doner, Pur. Agt. (taxicab manufacturers)—lathes, drills, saws, grinders, milling and woodworking machines, miscellaneous tools, etc., for new plant.

Ill., Chicago — Continental Scale Wks., Inc., 2126 West 21 Pl., A. H. Hutchinson, Pur. Agt. (scale manufacturers)—lathes, drill presses, grinders, milling machines, boring machines, etc., for new plant at 5700 Claremont Ave.

Ill., Chicago—Dallas Brass & Copper Co., 820 Orleans St., H. C. Bauer, Pur. Agt.—additional equipment and machine tools for new plant addition.

Ill., Chicago — Heuer Bros., 1510 Blue Island Ave., A. Heuer, Pur. Agt. (auto body manufacturers) — additional woodworking machinery, saws, etc., for new plant addition.

Ill., Chicago—Illinois Central R.R. Co., 35 East 11th St., J. J. Bennett, Pur. Agt.—60 machine tools including drills, lathes, boring machines, grinders, etc., for new roundhouse at Markham.

Ill., Chicago—Northwest Buick Sales Co., 3444 Lawrence Ave., J. Kenderive—garage equipment including tool lathe, drill press, air compressor, etc.

Ill., Chicago—A. Plamindon Mfg. Co., 530 South Western Ave., J. E. Higgins, Pur. Agt.—lathes, drills, boring machines, grinders, etc., for plant addition.

Ill., Chicago—Roscoe Metal Products Co., 1522 South 52nd St., H. Cartwright, Vice-Pres. (sheet metal work)—lathes, drills, power shears, shafting, pulleys, etc.

Ill., Zion—National Office Supply Co., 2500 Deborah St., A. Stevenson, Pur. Agt., Pres.—machinery and tools for manufacture of office devices.

Mass., Arlington (Boston P. O.)—School Committee—manual training equipment including wood working machinery for new school on Lake St.

Mass., Brookline (Boston P. O.)—G. W. Bunnell, 56 Winchester St.—equipment and tools for four story service garage on Newbury St.

Mass., Brighton (Boston P. O.)—R. A. Jennings, 12 Everett St.—equipment and miscellaneous tools for large garage and repair shop at Harvard and Brighton Aves.

Mass., Quincy — R. H. Harriman, 560 Adams St.—miscellaneous tools and equipment for large service garage.

Mass., Rockport — Cape Ann Tool Co., Pigeon Cove—equipment for plant addition.

Mass., Somerville — M. Cota, 14 Mansfield St.—miscellaneous tools and equipment for repair and service garage, Main St. and Commonwealth Ave.

Mich., Detroit—Lamb Co., 1938 Franklin St.—24 or 30 in. planer, open side preferred.

Mich., Detroit—E. Leciuex, 224 Clinton Ave., (carpenter)—woodworking machines.

Neb., Omaha — Union Pacific R.R. Co., 15th and Dodge St., G. W. Bichimeir, Gen. Pur. Agt.—30 machine tools, including lathes, radial drills, presses, etc.

N. Y., Flushing—Company of Mastercraftsmen, Inc., Fifth Ave., and 47th St., New York, c/o Lockwood Greene Co., Engrs., 1 Pershing Sq., New York—complete equipment for furniture factory.

O., Chillicothe — Standard Elevator & Supply Co., W. H. Herrustein, Mgr.—2 lathes, 24 in. or smaller; 1 automatic screw machine; 1 slotter.

O., Cleveland—Gold Seal Electric Co., 12700 Ontario St.—No. 20 or 21, 2½ or 3 in. stroke punch press.

O., Dover—Penn Mold & Mfg. Co., R. Pitt, Pur. Agt.—complete equipment for brass foundry to manufacture castings, for bushings and bearings from 1½ ft. to 12 ft.

O., Columbus—Ford & Son, 242½ South High St., N. H. Ford Pur. Agt. (mfg. oil burning apparatus)—various size lathes, drilling machines, sanders, finishers, etc., for new plant.

O., Willoughby—A. E. Harrold—10 in. x 4 ft. screw cutting lathe, compound rest with clutch.

S. C., Aiken—J. L. Williamson—machinery including planes, etc., for complete saw mill plant.

Va., Richmond—J. G. Skelton Co. Inc., Virginia Ry. and Power Bldg., J. G. Skelton, Gen. Mgr.—motor driven traveling crane, 5 to 7 ton capacity, 30 to 50 ft. span (new or used).

Wash., Tacoma — Cascade Paper Co.—equipment for machine shop, wood chipping plant, etc., for proposed new pulp mill, on Chambers Creek.

Wis., Beaver Dam—Beaver Dam Fibre Co., O. O. Olman, Secy.—machinery, etc., for factory and machine shop.

Wis., Merrill—Raymond Lumber Co., M. Raymond, Pres.—planing mill equipment, with individual electric motors, for new mill.

Wis., Wisconsin Rapids — Prentiss-Wabers Mfg. Co., awarded contract for construction of a 52 x 250 ft. plant for the manufacture of camp furniture.

Ont., Milton—Canadian Wood Impregnating Co. — equipment, including vats, tanks, pumps, etc., for wood preservation and impregnating, to cost $125,000.

Opportunities for Future Business

Calif., Long Beach—Perfect Caster Mfg. Co., 3517 East 11 St., C. E. Brockman, Sales Mgr., plans the construction of a 51 x 50 ft. factory, here. Estimated cost $8,000.

Calif., Los Angeles — Public Service Comm., awarded contract for the construction of a 4 story, 20 x 60 ft. garage, at 220 South Hill St., $192,593. Noted Feb. 19.

Calif., Oakland—Kirsch Manufacturing Co., Sturgis, Mich., plans the construction of a plant for the manufacture of drapery hardware, on recently purchased site, here.

Calif., Redding — J. D. Wease will receive bids for the construction of a 100 x 140 ft. garage. Estimated cost $200,000. Mayo, Cowell & Bissell, 21 South San Joaquin St., Stockton, Archts.

Calif., Sacramento — McLaughlin Sheet Metal Wks., 221 J St., is having plans prepared for the construction of a 1½ story shop. Estimated cost $40,000. Dean & Dean, California State Life Bldg., Archts.

Calif., San Francisco—H. Lesser, et al., 58 2nd St., is having plans prepared for the construction of a 4 story garage, on 4th St. near Market. Estimated cost $250,000. Ashley & Evers, 58 Sutter St., Archts. Noted Apr. 16.

Conn., Milldale (Hartford P. O.)—Clark Bros. Bolt Co., is receiving bids for the construction of a 45 x 125 ft. addition, to factory. Estimated cost $40,000. A. T. Arnold, 34 West Meriden, Archt.

Conn., New Haven — M. Langrock and R. L. Klautz, c/o A. W. Boylene, 39 Center St., Archt. awarded contract for the construction of a 2 story garage, on Temple St. Estimated cost $200,000.

Fla., St. Petersburg—Ground Bros. Mfg. Co., plans the construction of a sash and door factory. Estimated cost $100,000. Architect not announced.

Ill., Chicago — Kellogg Box Board Co., 2555 West Taylor St., is having plans prepared for the construction of a 125 x 350 ft. factory on West Taylor St. Estimated cost $150,000. Moose & Neely, 219 East Superior St., Archts.

Ill., Murphysboro—Mobile & Ohio R.R., Fullerton Bldg., St. Louis, Mo., H. A. Wood, Ch. Engr. will rebuild the roundhouse, car and locomotive repair shops and machine shops, by day labor. Estimated cost $1,250,000.

Ill., Waukegan—National Office Supply Co., 2500 Deborah Ave., Zion, awarded contract for the construction of a 100 x 197 ft. factory building on Sheridan St., here. Estimated cost $50,000.

Kan., Hutchinson—Massey-Harris Harvester Co., plans the construction of an addition to assembling plant. Estimated cost $25,000.

Mass., Beverly—S. Glazer, 51 Hawthorne St., Chelsea, plans the construction of a repair and service garage at Wallace and Rantoul Sts., here. Estimated cost $50,000. Architect not selected.

Mass., Beverly—H. H. Whitman, North Beverly, awarded contract for the construction of a 2½ story, repair and service garage, on Grove St., Estimated cost $50,000.

Mass., Boston—A. B. Wells, c/o D. Somes, 240 Boylston St., awarded contract for the construction of a 2 story, repair and service garage, at 94 West Ceder St. Estimated cost $60,000.

Mass., Boston—Y D Service Garage, c/o L. S. Joslin, 339 Newbury St., Archt., is having preliminary plans prepared for the construction of a 3 story, 55 x 115 ft. service and repair garage, at 345-347 Newbury St. Estimated cost $100,000.

Mass., Brighton (Boston P. O.)—Electric Storage Battery Co., 720 Beacon St., Boston is having plans prepared for the construction of a 1 and 2 story, 135 x 274 ft. electric storage battery plant, on Ashford St., here. Estimated cost to exceed $100,000. Bigelow & Wadsworth, 3 Hamilton Pl., Boston, Archts.

Mass., Brighton (Boston P. O.)—R. A. Jennings, 12 Everett St., awarded contract for the construction of a 100 x 140 ft. garage and salesroom, at Harvard and Brighton Aves. Estimated cost $150,000.

Mass., Brookline (Boston P. O.)—Hotel Beaconsfield plans the construction of a 1 story service garage, on Gladstone St. Estimated cost $150,000. Architect not selected.

Mass., Cambridge — Dunster Realty Co., c/o E. B. Stratton, 25 Arch St., Archt. is receiving bids for a 70 x 120 ft. repair and service garage, at Mt. Auburn and Boylston Sts. Estimated cost $60,000.

Mass., Cambridge — Kendall Sq. Bldg. Trust, c/o F. E. Leland 292 Main St.,

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig iron inquiries show more signs of life; quotations are lower than last week in New York and Philadelphia districts. The price structure of ferrous products is weaker in all items from semi-finished steel back to the iron ore. Steel bars, however, hold firmly to $2.10 per 100 lb., Pittsburgh. Shapes and plates range from $2 to $2.10 per 100 lb. at mill. Black and galvanized sheets are down 10 to 15c. per 100 lb. in New York and Pittsburgh.

Non-Ferrous Materials—Tin is ½c. per lb. higher at New York warehouses than on Apr. 10, which marked the low point for the past six months. Zinc is the most active in demand of all the non-ferrous metals; prices remain firm. Lead is down about ¼c.; stocks reported heavy. Fabricated materials, scrap and wiping cloths are lower. Belting firmer in the East.

(All prices as of April 17)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.05
Northern Basic	23.27
Southern Ohio No. 2	23.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.26
Virginia No. 2	29.17
Basic	23.26
Grey Forge	23.75
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	26.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	23.77
Basic	23.77
Bessemer	23.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.60@2.70	3.89	3.45	3.80
No. 12	2.70@2.80	3.94	3.50	3.85
No. 14	2.80@2.90	3.99	3.55	3.95
No. 16	3.00@3.10	4.09	3.65	4.15
Black				
Nos. 17 and 21	3.25@3.35	4.40	4.15	4.30
Nos. 22 and 24	3.30@3.40	4.45	4.20	4.35
Nos. 25 and 26	3.35@3.45	4.50	4.25	4.40
No. 28	3.40@3.50	4.60	4.35	4.50
Galvanized				
Nos. 10 and 11	3.50@3.60	4.60	....	4.50
Nos. 12 and 14	3.60@3.70	4.70	....	4.60
No. 16	3.75@3.85	4.85	....	....
Nos. 17 and 21	3.90@4.00	5.00	....	4.90
Nos. 22 and 24	4.05@4.15	5.15	3.00	5.05
No. 26	4.20@4.30	5.30	4.15	5.20
No. 28	4.50@4.60	5.60	5.45	5.55

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	59½%	48%
3½ to 6 in. steel lap welded	48%	35%	53½%	40½%	56½%	45%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%, less 5%; class A, plus 23%. Cast iron, standard sizes, 36% off.

Size, Inches	List Price per Foot	Diameters Inches External	Diameters Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.85	8.00	7.20
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	7.00	8.25	7.85
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.15	4.00	3.80
Cold drawn flats, squares	4.65	4.50	4.30
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00@3.10 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb. Chicago, 3/32, 8.85c.; 5/32, 7¼c.; ⅛, 7.95c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.87½
Tin, 5-ton lots, New York			51.75
Lead (up to carlots), St. Louis	7.60	New York	8.50
Zinc (up to carlots), St. Louis	6.95	New York	7.87½

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	13.00	16.00	15.50
Copper sheets, base	21.75	21.75	22.00
Copper wire, base	19.25	21.25	20.00
Copper bars, base	20.87½	21.50	22.50
Copper tubing, base	23.75	24.25	24.00
Brass sheets, base	18.12½	18.62½	18.37½
Brass tubing, base	22.75	25.25	26.00
Brass rods, base	15.87½	16.37½	18.37½
Brass wire, base	18.62½	20.12½	20.00

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1–15 ton lots	27.20	28.00	27.00
Zinc sheets (casks)	11.00	11.50	11.37
Solder (½ and ½), (case lots)	36.00	37.00	.....
Babbitt metal (83% tin)	60.00	63.00	50.00
Babbitt metal (35% tin)	28.00	20.50	28.00
Nickel (ingots) f.o.b. refinery	29.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	33.00	.....	.....
Nickel (F shot) f.o.b. refinery	30.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.00@11.50	11.25	10.50@11.00
Copper, heavy, and wire	10.75@11.00	11.00	10.25
Copper, light, and bottoms	9.25@9.75	9.00	9.00
Heavy lead	6.25@6.50	6.25	6.50@6.75
Tea lead	5.25@5.50	3.75	5.50@5.75
Brass, heavy, yellow	6.75@7.25	6.50	7.00
Brass, heavy, red	8.50@8.75	8.75	8.00
Brass, light	5.75@6.00	5.50	6.00
No. 1 yellow rod turnings	7.25@7.50	7.00	7.75
Zinc	4.00@4.25	3.75	4.25

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$22.85	$21.00
"A" Grade:				
IC,	20x28, 112 sheets	19.00	18.80	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	13.00	12.20	13.00
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.80@6.90	6.75

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.14
Cotton waste, colored, per lb.	.10@.15½	.18	.09½
Wiping cloths, 13¼x13¼, per lb	11.50	36.00 per M	.11
Wiping cloths, 13¼x20½, per lb.	....	45.00 per M	.11
Sal soda, per 100 lb. keg	2.25	2.25	2.00
Roll sulphur, per 100 lb. keg	3.60	3.25	2.85
Linseed oil, per gal., 5 bbl. lots	1.09	1.24	1.26
Lard cutting oil, 25% lard, per gal.	.60	.50	.32
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.33	.35	.21
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	30–10%	40%	40–2½%
Heavy grade	20–5%	30%	38–5%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50–5%	50–10%	60%
Second grade	50–10–5%	60–5%	65%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0349
Cold finished shafting	per lb.	.0415	.0415	.044
Brass rods	per lb	.1587½	.1712½	.155
Solder (½ and ½)	per lb.	.36	.40	.39
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	.60	.60	.55
Machine oil	per gal.	.33	.33	.29
Belting, leather, medium	off list	30–10%	40–2½%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	45%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$4.86	$5.84	$5.00
Emery paper	10.71	11.00	11.00
Emery cloth	28.00	31.12	32.75
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.50
Cloth	3.38	2.67	3.55
Fire clay, per 100 lb. bag	.....	.65	.75
Coke, prompt furnace, Connellsville	per net ton		3.25@3.75
Coke, prompt foundry, Connellsville	per net ton		4.00@4.50
White lead, dry or in oil	100 lb. kegs	New York, 15.75	
Red lead, dry	100 lb. kegs	New York, 15.75	
Red lead, in oil	100 lb. kegs	New York, 17.25	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%. Machine bolts, up to 1x30-in., with cold punched and hot-pressed hex. nuts, also button head bolts with hex. nuts are $3.50 per 100 lb. at Cleveland.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¼-in., $1.00 per 100. List plus 35% at New York warehouses; with hex. heads, $4.65 per 100 lb. net at Chicago.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x¼-in., 2c. each. Discount 70% for $\frac{5}{16}$-in. and smaller and 65% for ⅜-in. and larger.
Case hardened ¼x¼-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in., $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅜-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c., longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅜-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Archt. awarded contract for the construction of a 3 story, 105 x 225 ft. garage, at 20-50 Hayward St. Estimated cost $250,000.

Mass., Dorchester (Boston P. O.)—J. Waldman, 38 Hobson St., Brighton is receiving bids for the construction of a 150 x 160 ft. repair and service garage, on Livingston St., here. Estimated cost $100,000. S. S. Eisenberg, 46 Cornhill, Boston, Archt.

Mass., Lawrence—L. Guerrern, 87 Broadway, will build a repair and service garage, on Essex St., by day labor under supervision of architect. Estimated cost $40,000. H. Petzeld, Bay State Bldg., Archt.

Mass., Lynn — Bureau of Water Comrs. is having plans prepared for the construction of a 2 story, 60 x 140 ft. repair shop and garage, on Bennett St. Estimated Cost $75,000. R. F. Handy, City Hall, Archt.

Mass., Malden (Boston P. O.)—Boston Elevated Railway Co., Park Sq. Bldg., Boston, plans the construction of a repair and service garage, here. Estimated cost $50,000. Company Engrs.

Mass., Medford (Boston P. O.)—Boston Elevated Railway Co., Park Sq. Bldg., Boston, plans the construction of a 112 x 125 ft. service and repair garage, on Salem St. Estimated cost $120,000. Private plans.

Mass., Newtonville (Boston P. O.)—Newton Motor Sales Co., West Newton Sq., Newton, awarded contract for the construction of a 1 and 2 story, 30 x 70 and 60 x 105 ft. repair and service garage, on Washington St., here. Estimated cost $50,000. Noted Apr. 16.

Mass., Quincy — R. P. Harriman, 560 Adams St., will build a 50 x 100 ft. garage with 35 x 50 ft. addition on Adams St. Estimated cost $40,000. Clark, Batty & Gallegher, 13 Temple St., Archts.

Mass., Rockport — Cape Ann Tool Co., Pigeon Cove, is receiving bids for the construction of a 2 story, plant addition. J. O. DeWolf, 45 Bromfield St., Boston, Archt. & Engr.

Mass., Roxbury, (Boston P. O.) H. Rittenberg, 12 Garden St., Boston, awarded contract for the construction of a repair and service garage, on Dudley St. Estimated cost $50,000.

Mass., Salem—Wetmore & Simons, 118 Washington St. awarded contract for a 1 story repair and service garage at Washington and Derby St. Estimated cost $50,000.

Mass., Somerville—M. Cota, 14 Mansfield St., awarded contract for the construction of a 60 x 100 ft. repair and service garage, at Main St. and Commonwealth Ave. Estimated cost $40,000. Noted Apr. 16.

Mass., Somerville—Graff Underwood Co., 18 Beacon St., Boston, plans the construction of a factory, for the manufacture of office devices, on recently purchased site, on Beacon St., here. Architect not selected.

Mich., Detroit—Fisher Body Corporation, General Motors Bldg., awarded contract for the construction of a 60 x 500 ft. body factory, on St. Antoine St., here. Estimated cost $50,000.

Minn., Minneapolis—John A. Holmes Mfg. Co., 69 Twelfth St., plans the construction of a factory for the manufacture of wood boxes and containers, at Central and 18th Aves.

Minn., St. Paul—Northern Pacific R.R. Railway Bldg., plans the construction of a group of 6 buildings, including a 40 x 97 ft. car shop, 40 x 40 boiler plant, 2 story 50 x 112 ft. commissary building, etc. Estimated cost $85,000. O. M. Rognan, 1228 Railway Bldg., Archt.

Mo., Kansas City—Kansas City Bolt & Nut Co., Independence and Winchester Sts., awarded contract for the construction of three rolling mill housings for manufacture of galvanized and black steel sheets, as addition to plant, here. Estimated cost $150,000.

Mo., North Kansas City—Deckard Steel & Wire Co., Pittsburg, Kan., plans the construction of a plant for the manufacture of industrial cars, on 2½ acre site, recently purchased. Estimated cost $250,000.

Mo., St. Louis — G. T. Burdeau Real Estate Co., 801 Chestnut St., is having preliminary plans prepared for the construction of a 130 x 275 ft. auto service garage, at Washington and Jefferson Sts. Estimated cost $150,000. Private plans.

Mo., St. Louis — Hall & Brown Wood Working Machinery Co., Broadway and Tyler St. awarded contract for the construction of a 2 story, 31 x 80 ft. wood working machinery plant, at 1933 North Broadway.

Mo., Springfield—N. F. Fellows, et. al. 529 St. Louis Ave., awarded contract for the construction of a 2 story, 50 x 175 ft. garage, on St. Louis Ave.

Mo., Tarkio—Bd. of Education, E. M. Hackett, Secy., Farmers Bank Bldg., will receive bids until April 27 for the construction of a 2 story, 96 x 185 ft. school, with manual training department. H. I. Goddard, 612 Interstate Bldg., Kansas City, Archt.

N. J., Trenton—W. E. S. Dyer, Land Title Bldg., awarded contract for the construction of an 82 x 162 ft. machine shop, on Fair St. Estimated cost $135,000.

N. Y., Buffalo—Donner Steel Co., Abbott Rd., plans the construction of 2 mill buildings on Abbott Rd. Estimated cost $70,000.

N. Y., Flushing—Company of Mastercraftsmen, Inc., Fifth Ave. and 47th St., New York, have awarded contract to Lockwood Greene & Co., Engrs., 1 Pershing Sq., New York, for design and construction of a 5 story, 60 x 240 ft. furniture factory, here.

N. Y., New York—Atlas Body Wks. Co., 137 McKinley St., Bridgeport, Conn. will soon award contract for the construction of a 2 story, 100 x 100 ft. garage at 139th St. and Southern Blvd. here. H. E. Koerner, 164 State St. Bridgeport, Archt.

N. C., Thomasville — Thomasville Furniture Co., plans the construction of addition to furniture factory, including drying house, boiler room, etc. Estimated cost $60,000. Machinery will be required.

Okla., Blackwell — Tredway Boiler & Welding Works, will soon receive bids for for the construction of a 50 x 75 ft. factory, for metal welding, electric arc and oxyacetylene, and boiler making. Private plans.

O., Cleveland—City, H. Wright, Director of Public Utilities, City Hall, is having preliminary plans prepared for the construction of an 80 x 120 ft. machine shop, on West 41st St. and other improvements. Total estimated cost $250,000. C. G. Beckwith, City Hall, Engr. and Archt.

O., Cleveland — Fisher Ohio Body Co., East 140 and Cort Rd., awarded contract for the construction of an 82 x 210 ft. press building, 84 x 112 ft. wing, and 33 x 180 ft. train shed, at East 140 St. Estimated cost $150,000.

O., Cleveland—Franklite Co., D. Frankel, Pres., 5016 Woodlawn Ave., is having plans prepared for the construction of a 3 story factory on East 51st St., to replace fire loss. Estimated cost $40,000. A. Sogg, 3030 Euclid Ave., Archt.

O., Cleveland—Sabin Machine Co., 6536 Carnegie Ave., H. B. Sabin, Pres., will soon award contract for the construction of a 3 story, 45 x 90 ft. factory addition, at 65th St. and Carnegie Ave. Estimated cost $40,000. Private plans.

O., Cleveland—Star Machine & Tool Co., 6505 Carnegie Ave., J. J. Schugar, Pres., awarded contract for the construction of a 93 x 100 ft. machine shop on East 93rd St. Estimated cost $40,000. Noted April 9.

O., Dover—Penn Mold & Mfg. Co., will soon receive bids for the construction of a 77 x 160 ft. brass foundry, as factory addition, on West 3rd St. Estimated cost $40,000.

Pa., Philadelphia — Atlas Electric Co., 1218 Hamilton Rd., plans the construction of a 2 story, 56 x 72 ft. electric repairs factory on Green St. Heacock & Hokanson, 1211 Chestnut St., Archts.

Pa., Philadelphia — Willard Storage Batteries Co., 3613 Walnut St., awarded contract for the construction of a 100 x 120 ft. service building, at plant.

Pa., Pittsburgh—Pittsburgh Piping and Equipment Co., 35th and Charlotte Sts., awarded contract for the construction of plant, three buildings, 120 x 300 ft., 80 x 150 ft. and 50 x 220 ft. at 43rd and Charlotte Sts.

Pa., Ridgeway — Hyde Murphy Co., will build a 4 story, 70 x 170 ft. addition to planing mill. Estimated cost $100,000. Private plans. Owner awards sub-contracts.

Pa., Scranton—P. J. Casey, Hotel Casey, will receive bids until April 27 for the construction of a 4 story, 120 x 160 ft. garage, on Lackawanna Ave. Estimated cost $225,000. L. M. Davis, 616 Spruce St., Archt.

R. I., Providence — Briggs Engineering and Construction Co., 71 Union Trust Bldg., plans the construction of a 4 story garage over Providence River. Estimated cost $1,000,000.

R. I., Providence — Providence Gas Co., Turks Head Bldg., will receive bids about May 1, for the construction of a 3 story, 200 x 300 ft. shop building and garage, at Dexter and Waldo St. Estimated cost $600,000. Jenks & Ballou, 1035 Grosvenor Bldg., Archts. Noted Sept. 18, 1924.

S. C., Aiken—J. L. Williamson plans the construction of a complete saw mill and milling plant, here.

Tex., Houston — Lloyd Metal Co., 1320 Carr St., will build a 50 x 100 ft. foundry by day labor. A. Delisle, 1908 Drew Ave., Archt.

Tex., Waco — Methodist Orphanage is having plans prepared for the construction of a 40 x 125 ft. garage, for manual training work. M. W. Scott, 412½ Franklin Ave., Archt.

Wash., Tacoma — Cascade Paper Co., plans the construction of a pulp mill, with machine shop, wood chipping plant, etc., at Chambers Creek, near here. Estimated cost $400,000.

Wis., Beaver Dam—Beaver Dam Fibre Co., O. O. Olman, Secy., Juneau, will build a 2 story, 70 x 130 ft. factory, with garage and machine shop, by day labor. Estimated cost $50,000. Private plans.

Wis., Madison—Fox Motor Sales Co., 105 East Doty St., will build a 2 story, 122 x 133 ft. garage and repair shop, by day labor. Estimated cost $150,000. Noted Apr. 2.

Wis., Madison—Madison Buick Co., 16 East Doty St., plans the construction of a 2 story, 100 x 200 ft. garage, on Wilson St., to replace fire loss. Estimated cost $150,000. Architect not selected.

Wis., Madison—J. Peterson, 102 South Orchard St., is having plans prepared for the construction of a 2 story, 66 x 132 ft. garage and repair shop, on Fairchild St. Estimated cost $200,000. Private plans.

Wis., Merrill—Raymond Lumber Co., M. Raymond, Pres., plans the construction of a 2 story planing mill, to replace fire loss. Estimated cost $50,000. Private plans.

Wis., Milwaukee—Kerner Incinerator Co., 1029 Chestnut St., awarded contract for the construction of a 1 and 2 story, 72 x 100 ft. factory, on East Water St., Noted Mar. 19.

Wis., Milwaukee—Roberts Brass Co., 178 Lincoln Ave., awarded contract for the construction of a 2 story, 70 x 106 ft. factory addition for the manufacture of brass goods and plumbing fixtures, on Lincoln Ave. Estimated cost $50,000. Noted Feb. 26.

Wis., Neopit—Menominee Indian Mills, E. A. Allen, Supt., will receive bids until May 8 for the construction of a 2 story, 66 x 95 ft. saw mill, on Indian reservation, here.

Wis., Racine — Racine Malleable and Wrought Iron Co., Lakeside, plans to rebuild 50 x 300 ft. manufacturing plant to replace fire loss. Architect not selected.

Wis., Racine — Standard Foundry Co., 1600 Kewaunee St., is having plans prepared for the construction of a 200 x 240 ft. foundry. Estimated cost $250,000. A. Wickland & Co., 5 South Wabash Ave., Chicago, Ill., Archt and Engr.

Wis., Two Rivers — Kahlenberg Bros., awarded contract for the construction of an 85 x 105 ft. plant for the manufacture of oil and marine motors. Estimated cost $50,000.

Wis., Wauwatosa—C. F. Dotzauer, 562 Watkins Ave., (manufacturer of sheet metal)—turning machine, 3 ft. roller, 8 ft. brake.

Wis., West Allis—Gerlinger Steel Casting Co., 60th Ave. and Mitchell St., will build a 42 x 73 ft. foundry by day labor, on 60th Ave. Estimated cost $15,000. Private plans.

B. C., Vancouver—Townley & Matheson, Archts., 325 Homer St., will receive bids about April 30th, for the construction of a 3 story, 120 x 125 ft. garage, at Seymour & Smythe St. for Vancouver Motors Ltd., 1531 15th Ave., West. Estimated cost $150,000.

Ont., Frood—Mond Nickel Co., Coniston, plans the construction of a 32 x 120 ft. machine shop and 32 x 106 ft. foundry, here. Estimated cost $100,000. L. G. Ingolsfrud, Coniston, Archt.

Ont., Mitchel — Wettlaufer Mitchell Co. Ltd., is having plans prepared for the construction of a plant for the manufacture of concrete mixers, tile machines, tools, etc. Estimated cost $200,000. Private plans.

Ont., Toronto—Exide Batteries of Canada, 153 Duffern St., awarded contract for the construction of a 2 story addition to plant. Estimated cost $50,000. Noted Feb. 19.

Ont., Toronto—Canadian SKF Co., 83 King St., West, plans the construction of a 2 story, plant, for the manufacture of ball bearings, on Bay St. Estimated cost $50,000.

Que., Grand Mere — Canadian National R. R., Montreal, C. S. Gizowski, Ch. Engr. of Construction, plans the construction of railroad machine shops, at St. Georges. Estimated cost $300,000.